DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, LOS ANGELES DISTRICT
5950 LA PLACE COURT, SUITE 160
CARLSBAD CA, 92008

January 18, 2024

SUBJECT: Permit Application Request

Jim Minnick
Imperial County Planning & Development Services
801 Main Street
El Centro, California 92243

Dear Mr. Minnick:

The U.S. Army Corps of Engineers Regulatory Division (Corps) has received your Notice of Preparation for a Draft Environmental Impact Report (EIR) for the Lithium Valley Specific Plan. The projects addressed in this EIR would take place within an approximately 51,786-acre area adjacent to the southeastern shore of the Salton Sea, Imperial County, California.

Projects analyzed under the EIR may require a Department of Army (DA) permit from the Corps. A DA permit is required for the discharge of dredged or fill material into, including any redeposit of dredged material other than incidental fallback within, "waters of the U.S.," including wetlands and adjacent wetlands pursuant to Section 404 of the Clean Water Act of 1972. Examples include, but are not limited to the following activities:

a. creating fills for residential or commercial development, placing bank protection, temporary or permanent stockpiling of excavated material, building road crossings, backfilling for utility line crossings and constructing outfall structures, dams, levees, groins, weirs, or other structures;
b. mechanized land clearing and grading which involve filling low areas or land leveling, ditching, channelizing and other excavation activities that would have the effect of destroying or degrading waters of the U.S.;
c. allowing runoff or overflow from a contained land or water disposal area to re-enter a water of the U.S.; and
d. placing pilings when such placement has or would have the effect of a discharge of fill material.

Regulated activities, such as those listed above, in the Salton Sea and associated jurisdictional waters of the U.S. would require a DA permit from the Corps. The Corps is currently evaluating several DA permit applications in and around the Salton Sea including potential geothermal energy and lithium extraction projects as well as aquatic resource restoration and dust suppression projects in response to the sea's receding

shoreline. The Corps is also processing Clean Water Act Section 404 Letter of Permission (LOP) procedures, associated with the State's Salton Sea Management Plan (SSMP) 10-Year Plan for the State of California Natural Resources Agency, the Department of Water Resources, and the Department of Fish and Wildlife. The SSMP proposes to implement 29,800 acres of habitat restoration and dust suppression projects on lakebed areas that have been, or will be, exposed at the Salton Sea to comply with a State Water Resources Control Board Order.

If you have any questions regarding the Corps' regulatory program or how to apply for a DA permit, please contact me at 760-602-4830 or via email at shanti.a.santulli@usace.army.mil. Please refer to this letter and SPL-2024-00037-SAS in your reply. Please help me to evaluate and improve the regulatory experience for others by completing the customer survey form at https://regulatory.ops.usace.army.mil/customer-service-survey/.

Sincerely,

Shanti Abichandani Santulli
Senior Project Manager
San Diego & Imperial Counties Section
Regulatory Division

Keegan Kingsbury

From: Alana-Patris Loyer <ployer@swccd.edu>
Sent: Monday, February 12, 2024 2:43 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

This analysis should carefully consider cumulative impacts on the entire Imperial County Air Pollution Control District, which is already severely degraded. Any worsening air quality would significantly impact public health and likely exceed legal thresholds, which must be analyzed and mitigated. Given these concerns, please consider a project alternative requiring no reduced inflow to the Salton Sea.

Thank you.

Sincerely,
Alana-Patris Loyer
1638 Yale St
Chula Vista, CA 91913

February 19, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Air Quality, Biological Resources, Cumulative Effects, Drainage/Absorption, Geology/Soils, Hazards and Hazardous Materials, Hydrology/Water Quality, Land Use/Planning, Mineral Resources, Noise, Population/Housing, Public Services, Septic System, Vegetation, Wetland/Riparian
Resident Name: Alison DeGuere
Resident City/Town: Bombay Beach

Scoping Comments:
I've been visiting Bombay Beach and the surrounding areas for a few years now and am deeply concerned about the impact that lithium mining will have on this community and the surrounding environs.

February 19, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Aesthetics, Agriculture and Forestry, Air Quality, Biological Resources, Cultural resources, Cumulative Effects, Drainage/Absorption, Geology/Soils, Hazards and Hazardous Materials, Hydrology/Water Quality, Land Use/Planning, Mineral Resources, Noise, Population/Housing, Public Services, Recreation, Schools/Universities, Septic System, Sewer Capacity/Solid Waste, Transportation, Vegetation, Wetland/Riparian, Wildfire, Other
Resident Name: Amanda Simons
Resident City/Town: Bombay Beach

Scoping Comments:
On behalf of myself, Amanda Simons, visitor to Bombay Beach and supporter of the community who resides there, I am pleased to offer scoping comments for Imperial County's Program Environmental Impact Report (PEIR) for the proposed Lithium Valley Specific Plan Project (Project) (SP22-0001).

We understand that the Lithium Valley Specific Plan and PEIR is intended to provide a framework and guidance for the necessary infrastructure and facilities and streamline the development and permitting of additional renewable energy facilities, mineral recovery, lithium battery manufacturing, and other renewable industries within an approximately 51,786-acre area adjacent to the Salton Sea. Currently, the Imperial County Planning & Development Services Department is seeking the community's comments about the effects this project might have on the environment and suggestions as to alternatives, mitigation or ways the project may be revised to reduce or avoid any significant environmental impacts.

Other concerns are: the future levels of the Salton Sea body of water

The long term plan to prevent stranded infrastructure

Overall project cleanup agenda

Making sure that cleanup costs don't fall upon the town/county/state people and taxpayers

The companies involved will be held responsible for any environmental disaster, no matter how big or how small.

These topics listed above are of great concern because of the environmental impact that it will have on myself, my property, and the surrounding community, be it direct, indirect, or cumulative impacts. The analysis should consider the impacts of these topics because of the importance of the impact on the geography, and affected populations within Imperial County.

Thank you for taking the time to consider my suggested topics for analysis. I am looking forward to seeing my comments reflected in the draft of the Programmatic Environmental Impact Review for the Lithium Valley Specific Plan.

February 20, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Aesthetics, Agriculture and Forestry, Air Quality, Biological Resources, Cultural resources, Cumulative Effects, Drainage/Absorption, Geology/Soils, Hazards and Hazardous Materials, Hydrology/Water Quality, Land Use/Planning, Mineral Resources, Noise, Population/Housing, Public Services, Recreation, Schools/Universities, Septic System, Sewer Capacity/Solid Waste, Transportation, Vegetation, Wetland/Riparian, Wildfire
Resident Name: Amélie Ramon

Scoping Comments:

i am Amélie, i am concerned by the environmental impact of this development

I am concerned about the long lasting effects of the environmental topics listed

Keegan Kingsbury

From: Ana Brazaityte <ana@trussandore.com>
Sent: Monday, February 12, 2024 1:22 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

This analysis should carefully consider cumulative impacts on the entire Imperial County Air Pollution Control District, which is already severely degraded. Any worsening air quality would significantly impact public health and likely exceed legal thresholds, which must be analyzed and mitigated. Given these concerns, please consider a project alternative requiring no reduced inflow to the Salton Sea.

Thank you.

Sincerely,
Ana Brazaityte
363 38th st
oakland, CA 94609

Keegan Kingsbury

From: Ann Bein <abein@ucla.edu>
Sent: Monday, February 12, 2024 1:06 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

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Thank you.

Sincerely,
Ann Bein
2216 Overland Ave
Los Angeles, CA 90064

Keegan Kingsbury

From: Ann Filor <ayada@pacbell.net>
Sent: Monday, February 12, 2024 2:01 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

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Thank you.

Sincerely,
Ann Filor
1680 Merrill Loop
San Jose, CA 95124

Keegan Kingsbury

From: Ann Wasgatt <wasgatta@gmail.com>
Sent: Monday, February 12, 2024 6:56 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

This analysis should carefully consider cumulative impacts on the entire Imperial County Air Pollution Control District, which is already severely degraded. Any worsening air quality would significantly impact public health and likely exceed legal thresholds, which must be analyzed and mitigated. Given these concerns, please consider a project alternative requiring no reduced inflow to the Salton Sea.

Thank you.

Sincerely,
Ann Wasgatt
308 Alta Vista Ave
Roseville, CA 95678

Keegan Kingsbury

From: Anne M. Van Alstyne <avanalstyne@odysseydance.com>
Sent: Monday, February 12, 2024 1:36 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

This analysis should carefully consider cumulative impacts on the entire Imperial County Air Pollution Control District, which is already severely degraded. Any worsening air quality would significantly impact public health and likely exceed legal thresholds, which must be analyzed and mitigated. Given these concerns, please consider a project alternative requiring no reduced inflow to the Salton Sea.

Thank you.

Sincerely,
Anne M. Van Alstyne
2750 Artesia Blvd
Redondo Beach, CA 90278

February 19, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Air Quality, Cumulative Effects, Drainage/Absorption, Geology/Soils, Hazards and Hazardous Materials, Hydrology/Water Quality, Land Use/Planning, Noise, Population/Housing, Public Services, Schools/Universities, Sewer Capacity, Vegetation
Resident Name: Submitted anonymously
Resident City/Town: Imperial County

Scoping Comments:
I'm a 4th year environmental engineering student and my concerns of using about 57K acres of land to be used for lithium extraction are totally extreme. I am writing so that this project profoundly studies the environmental impacts- long term and short term. I am concerned for the changes in AQI, the increase in concentrations of toxic metals in the air and water, the possible health effects that this project could bring and how the nearby families can be protected from the mining of lithium.

I believe this project shouldn’t be done. It will cause thousands of hospital visits and saturate the availability that we already lack. We are talking about 52K acres of land that will be mined, I believe the county of Imperial Valley needs to adhere to EPA and CEQA laws as well as perform a SWPPP to abide by the environmental and regulatory laws already existing if the project breaks ground. Regardless, a 50 year study plan should be performed to analyze the impacts that soil, ground water and air quality will receive due to this project as well as the distance that the lead and other toxic substances already existing in the salton sea will travel and the communities that will mostly be affected.

February 19, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Agriculture and Forestry, Air Quality, Biological Resources, Cultural resources, Cumulative Effects, Hazards and Hazardous Materials, Hydrology/Water Quality, Noise, Public Services
Resident Name: Submitted anonymously
Resident City/Town: Imperial County

Scoping Comments:
I'm writing out of concern for my and my community's health and air quality concerns. The air here is already plagued with problems. We don't know what we don't know and it is up to the public to determine what questions should be asked.

Hire professionals to ask these questions instead of relying on an uninformed public.

February 19, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Aesthetics, Air Quality, Cumulative Effects, Hydrology/Water Quality
Resident Name: Submitted anonymously
Resident City/Town: Imperial County

Scoping Comments:
I am writing to state my concern that the reduction of the Salton Sea will cause dust pollution and more.

February 19, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Hazards and Hazardous Material, Land Use/Planning, Mineral Resources, Public Services, Schools/Universities
Resident Name: Submitted anonymously
Resident City/Town: Bombay Beach

Scoping Comments:
I am a resident of Bombay Beach, I am curious and concerned regarding the positive and negative impacts of this project on the community.

February 19, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Aesthetics, Agriculture and Forestry, Air Quality, Biological Resources, Cultural resources, Cumulative Effects, Drainage/Absorption, Geology/Soils, Hazards and Hazardous Materials, Hydrology/Water Quality, Land Use/Planning, Mineral Resources, Noise, Population/Housing, Public Service, Septic System, Sewer Capacity/Solid Waste, Vegetation, Wetland/Riparian, Wildfire
Resident Name: Submitted anonymously

Scoping Comments:
I'm a member of a local temporary community. I would like to have a positive environmental impact on the land around the salton sea.

It is crucial to scrutinize these matters due to their potential ecological repercussions, which could influence me, my estate, and the broader neighborhood in various ways, whether directly, indirectly, or through aggregate effects. The significance of these subjects in relation to the local geography and the residents of Imperial County merits thorough consideration in the impact study. I appreciate your acknowledgment of my concerns as part of the assessment process. I am eager to see my input reflected in the Programmatic Environmental Impact Review draft for the Lithium Valley Specific Plan.

150 SOUTH NINTH STREET
EL CENTRO, CA 92243-2850

TELEPHONE: (442) 265-1800
FAX: (442) 265-1799

AIR POLLUTION CONTROL DISTRICT

February 16, 2024

Jim Minnick
Planning & Development Services Director
801 Main Street
El Centro, CA 92243

SUBJECT: Notice of Preparation of Draft Environmental Impact Report for the Lithium Valley Specific Plan

Dear Mr. Minnick:

The Imperial County Air Pollution Control District (Air District) appreciates the opportunity to review and comment on the Notice of Preparation (NOP) of the Draft Environmental Impact Report (EIR) for the Lithium Valley Specific Plan (Project). The Project aims to develop a Specific Plan (SP) to frame and guide the development of renewable energy sources, such as geothermal and solar energy, as well as lithium extraction and associated industrial uses and infrastructure improvements. The project area covers approximately 51,786 acres and consists primarily of existing agricultural properties, wetlands, wildlife areas, open spaces, and energy facilities in the northern portion of the Imperial Valley, along the southeastern part of the Salton Sea.

The Air District reviews all projects for potential impacts to air quality. The programs, rules and regulations of the Air District, in conjunction with the California Environmental Quality Act (CEQA), the most current *CEQA Air Quality Handbook for Imperial County* (Handbook), and the Air District's State Implementation Plans (SIPs) for Ozone, $PM_{2.5}$ and PM_{10}, work together to ensure air quality improves or does not degrade. Currently, the non-attainment status of marginal of the 2015 ozone standard, moderate for $PM_{2.5}$, and the maintenance requirements for PM_{10} are the driving criteria in establishing the thresholds for NOx, ROG, PM_{10}, SO_x and CO as found in the Handbook. The Air District strongly recommends referencing the Handbook during the generation of the EIR as the Handbook has helpful information regarding the development of an adequate air quality analysis and emission threshold information for the area.

To remain consistent with Section 4.3 of the Handbook which states "Consultation between the Lead Agency and the ICAPCD is strongly recommended for those development projects, . . . General plans, Specific Plans and/or Enterprise Zones . . . the intent of the consultation is to provide

the Lead Agency with helpful information on the applicability of a Comprehensive Air Quality Analysis Report or an EIR on proposed projects" the Air District would strongly recommend the applicant and/or their consultant(s) contact the Air District directly to coordinate with our office for the development of the EIR. Discussions with the Air District will also include adequately evaluating GHGs in consideration of the court's Golden Door ruling (*Golden Door Properties, LLC v. County of San Diego*, 2020).

The following is a synopsis of the information pertinent to the development of a Comprehensive Air Quality analysis. A thorough analysis should include a description, impacts and health consequences of all air quality and associated emissions. The analysis must be conducted using the Air Districts approved modeling factors.[1] The analysis should include short- and long-term emissions as well as daily and yearly emission calculations. Project alternatives should be included along with a thorough emissions analysis per alternative. A description of the Air District attainment status, State and Federal, is required as is describing any regulatory restrictions to the project.

A health risk assessment should be conducted for projects locating near already existing facilities with a potential to emit toxics in accordance with Section 4.6 of the Handbook which states "Development projects which locate in close proximity to already existing industrial type operations which have the potential to emit toxic or hazardous air pollutants . . . Such projects may be required to prepare a health risk assessment to determine the potential level of risk associated with the operation. The ICAPCD should be consulted on any project with the potential to emit toxic or hazardous air pollutants." Typically, these health risk assessments are of a quantitative nature but can be a mixed qualitative and quantitative analysis. In any case, the relative human exposure, location of the project, distance to sensitive receptors all should be considered when developing the risk assessment. Projects anticipating heavy volumes of traffic should conduct hot spot modeling.[2] Hot spot modeling will help determine compliance with the state CO standard at intersections and roadway links as determined by traffic impact analysis.

Existing and proposed projects must have a cumulative impact analysis. For each sub-analysis and risk assessment mitigation measures should be identified, quantified for effectiveness, and incorporated into the environmental document (i.e. Environmental Impact Report EIR or Environmental Impact Statement EIS). All mitigation measures must follow District Rules and Regulations including the most current Handbook. Consultation with the most recent Clean Air Plans (SIPs), District Rules and Regulations and other Air District approved programs is strongly recommended to achieve effective applicability of standards. When it becomes apparent that on-site mitigation is insufficient to reduce the impacts to insignificance then off-site mitigation should be discussed and appropriately applied.

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[1]The most current modeling tool recently adopted is CalEEMod.

[2] Using APCD approved hot spot modeling such as CALINE4, developed by and available through the California Department of Transportation.

Finally, in accordance with Assembly Bill 32 known as the Global Warming Solutions Act of 2006 and the most recent amendments to the CEQA Guidelines effective December 2018, a discussion of the impacts from Green House Gas (GHG) emissions and its relation to Climate Change is required. The California Air Pollution Control Officer's Association (CAPCOA) developed the *Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Heath and Equity* (GHG Handbook) to assist in creating an adequate GHG analysis. Since the Air District has not currently developed its own GHG thresholds, using a threshold from an area similar in size, topography, climate, and population is preferred by the Air District.

All Air District rules and regulations can be found for review on our website at https://apcd.imperialcounty.org/rules-and-regulations/, the Handbook can be accessed at https://apcd.imperialcounty.org/wp-content/uploads/2020/01/CEQAHandbk.pdf, and the GHG Handbook can be found at https://www.caleemod.com/handbook/index.html. Please contact our office at (442) 265-1800 to set up discussions for the project or if you have any further questions or concerns. The Air District looks forward to coordinating to help ensure consistency and enforceability of the project.

Respectfully,

Ismael Garcia
Environmental Coordinator

Reviewed by,
Monica N. Soucier
APC Division Manager

Keegan Kingsbury

From: April Parkins <april@phonecoop.coop>
Sent: Tuesday, February 13, 2024 5:48 AM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

This analysis should carefully consider cumulative impacts on the entire Imperial County Air Pollution Control District, which is already severely degraded. Any worsening air quality would significantly impact public health and likely exceed legal thresholds, which must be analyzed and mitigated. Given these concerns, please consider a project alternative requiring no reduced inflow to the Salton Sea.

Thank you.

Sincerely,
April Parkins
4285 Gilbert St
Oakland, CA 94611

Keegan Kingsbury

From: Arax Maksoudian <arax@accountinglm.com>
Sent: Monday, February 12, 2024 1:08 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

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Thank you.

Sincerely,
Arax Maksoudian
1156 Camino del Sur
San Dimas, CA 91773

February 20, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Air Quality, Land Use/Planning, Other
Resident Name: Aristeo O U
Resident City/Town: Niland

Scoping Comments:
Soy residente de Niland, el pueblo que el tiempo olvidó. Tenemos problemas con la Salton Sea, geotérmicas, y engordas de ganado. Y la planta eléctrica que trabaja con gas natural, con la agricultura, herbicidas, pesticidas, fertilizantes y ahora la planta de litio que va a traer otro problema con el agua. La calidad del aire no es buena en estos momentos. Adultos y niños sufren de asma y pronto habrá personas muriendo de cáncer de pulmón.

English Translation: "I am a resident of Niland, the town that time forgot. We have problems with the Salton Sea, geothermal, and cattle feedlots. And the electric plant that works with natural gas, with agriculture, herbicides, pesticides, fertilizers and now the lithium plant that will bring another problem with water. The air quality is not good right now. Adults and children are suffering from asthma and soon people will be dying of lung cancer."

Keegan Kingsbury

From: Ben Martin <benmartin12@stanfordalumni.org>
Sent: Monday, February 12, 2024 2:05 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

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Thank you.

Sincerely,
Ben Martin
49 Showers Dr Apt A340
Mountain View, CA 94040

February 20, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Aesthetics, Agriculture and Forestry, Air Quality, Biological Resources, Cultural resources, Cumulative Effects, Drainage/Absorption, Geology/Soils, Hazards and Hazardous Materials, Hydrology/Water Quality, Land Use/Planning, Mineral Resources, Noise, Population/Housing, Public Services, Recreation, Schools/Universities, Septic System, Sewer Capacity/Solid Waste, Transportation, Vegetation, Wetland, Wildfire.
Resident Name: Ben Tricklebank

Scoping Comments:

I live in the area and I am concerned about how the plans might impact the surrounding communities and environment.

Open to other reasonable courses of actions

Keegan Kingsbury

From: Blake Wu <skbkms@mail.com>
Sent: Wednesday, February 14, 2024 1:10 AM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

This analysis should carefully consider cumulative impacts on the entire Imperial County Air Pollution Control District, which is already severely degraded. Any worsening air quality would significantly impact public health and likely exceed legal thresholds, which must be analyzed and mitigated. Given these concerns, please consider a project alternative requiring no reduced inflow to the Salton Sea.

Thank you.

Sincerely,
Blake Wu
3600 Mt Diablo
Lafayette, CA 94549

February 20, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Public Services, Hydrology/ Water Quality, other
Resident Name: Blanca Mendoza
Resident Town: Niland

Scoping Comments:

I am worried that they will never make or open a post office in Niland, we don't know how this plant is going to affect us. This new plant its some that it might be bad for Niland residents it will affect our water town. I think we have enough bad stuff around Niland and its all over Imperial Valley.

February 19, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Agriculture and Forestry, Air Quality, Biological Resources, Cumulative Effects, Drainage/Absorption, Geology/Soils, Hazards and Hazardous Materials, Hydrology/Water Quality, Land Use/Planning, Mineral Resources, Septic System, Sewer Capacity/Solid Waste, Vegetation, Wetland/Riparian
Resident Name: Brandon Steenhoek

Scoping Comments:
I'm an artist and art lover, and want to support the discovery of environmental consequences of lithium extraction.

Keegan Kingsbury

From: Brenda Thompson <bthompson@sdsu.edu>
Sent: Monday, February 12, 2024 3:35 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

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Thank you.

Sincerely,
Brenda Thompson
4564 Olive Ave
La Mesa, CA 91942

Keegan Kingsbury

From: Brian Gray <bgraystar@sbcglobal.net>
Sent: Monday, February 12, 2024 1:10 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

This analysis should carefully consider cumulative impacts on the entire Imperial County Air Pollution Control District, which is already severely degraded. Any worsening air quality would significantly impact public health and likely exceed legal thresholds, which must be analyzed and mitigated. Given these concerns, please consider a project alternative requiring no reduced inflow to the Salton Sea.

Thank you.

Sincerely,
Brian Gray
7776 Palmyra Drive
Fair Oaks, CA 95628

February 20, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Aesthetics, Agriculture and Forestry, Air Quality, Biological Resources, Cultural resources, Cumulative Effects, Drainage/Absorption, Geology/Soils, Hazards and Hazardous Materials, Hydrology/Water Quality, Land Use/Planning, Mineral Resources, Noise, Population/Housing, Public Services, Recreation, Schools/Universities, Septic System, Sewer Capacity/Solid Waste, Transportation, Vegetation, Wetland/Riparian, Wildfire
Resident Name: Bryan Vega

Scoping Comments:

Hello, neighbors of Imperial County. I am Bryan Vega, your neighbor from Holtville, CA, and I am writing because I care about my community.

I think that Lithium Valley holds promise to “heal our economy” by introducing sustainable and environmentally conscious development. But we must remain mindful that regardless of the future outcome, the people of the imperial county will directly be affected by any adverse effects. The well being of the people of Imperial County must be at the core of every conversation.

I demand you consider adding time limitations for these projects. No industry should feel comfortable profiting at the expense of our environment. This is the only home we will ever have.

We must approach Lithium Valley at the pace of the people's trust. We must balance economic development with Environmental restoration.

California Department of Transportation

DISTRICT 11
4050 TAYLOR STREET, MS-240
SAN DIEGO, CA 92110
(619) 985-1587 | FAX (619) 688-4299 TTY 711
www.dot.ca.gov

February 20, 2024

11-IMP-Var
SR-78, SR-86, SR-111
Lithium Valley Specific Plan
NOP SCH#2023120104

Ms. Diana Robinson
Imperial County Planning
801 Main Street
El Centro, CA 92243

Dear Ms. Robinson:

Thank you for including the California Department of Transportation (Caltrans) in the review process of the Lithium Valley Specific Plan Notice of Preparation (NOP) document. The mission of Caltrans is to provide a safe and reliable transportation network that serves all people and respects the environment. The Local Development Review (LDR) Program reviews land use projects and plans to ensure consistency with our mission and state planning priorities.

Safety is one of Caltrans' strategic goals. Caltrans strives to make the year 2050 the first year without a single death or serious injury on California's roads. We are striving for more equitable outcomes for the transportation network's diverse users. To achieve these ambitious goals, we will pursue meaningful collaboration with our partners. We encourage the implementation of new technologies, innovations, and best practices that will enhance the safety on the transportation network. These pursuits are both ambitious and urgent, and their accomplishment involves a focused departure from the status quo as we continue to institutionalize safety in all our work.

Caltrans has the following comments:

Traffic Analysis
A Vehicle Miles of Travel (VMT) based Traffic Impact Study (TIS) should be provided for this project. Please use the Governor's Office of Planning and Research Guidance to identify VMT related impacts.[1]

[1] California Governor's Office of Planning and Research (OPR) 2018. "Technical Advisory on Evaluating Transportation Impacts in CEQA." https://opr.ca.gov/docs/20190122-743_Technical_Advisory.pdf

The TIS may also need to identify the proposed project's near-term and long-term safety or operational issues, on or adjacent to any existing or proposed State facilities.

Highway Access
Any access onto Caltrans property or facilities will require a discretionary review and encroachment permit application.

Hydrology
Caltrans generally does not allow development projects to impact hydraulics within the State's Right-of-Way (R/W). Any modification to the existing Caltrans drainage and/or increase in runoff to State facilities will not be permitted.

Freight
California's goods movement system is a complex, decentralized, and dynamic mixture of public and private infrastructure and one that involves private carriers and shippers, government planning authorities, Federal and State regulatory agencies that interact on a global, national, regional, and local scales.

The proposed Lithium Valley Specific Plan project aims at facilitating the existing and future renewable energy development in the Imperial Valley, and with that a significant impact to the existing freight movement in the region. Please consider coordination and reference with Caltrans' Office of Strategic Freight Planning as this project evolves.

Caltrans Office of Strategic Freight Planning (OSFP)
https://dot.ca.gov/programs/transportation-planning/division-of-transportation-planning/strategic-freight-planning

Hauling
The California Department of Transportation (Caltrans) has discretionary authority with respect to highways under its jurisdiction and may, upon application and if good cause appears, issue a special permit to operate or move a vehicle or combination of vehicles or special mobile equipment of a size or weight of vehicle or load exceeding the maximum limitations specified in the California Vehicle Code. The Caltrans Transportation Permits Issuance Branch is responsible for the issuance of these special transportation permits for oversize/overweight vehicles on the State Highway network. Additional information is provided online at:
http://www.dot.ca.gov/trafficops/permits/index.html

Noise
The applicant must be informed that in accordance with 23 Code of Federal Regulations (CFR) 772, Caltrans is not responsible for existing or future traffic noise impacts associated with the existing configuration of SR-86, SR-78 and SR-111.

Sustainability
Caltrans recommends collaboration between our agency and Imperial County on the proposed transportation related topics including adaptation strategies to help improve the County's resilience to potential climate change impacts and strategies to reduce VMT, and off-road and on-road greenhouse gas (GHG) emissions.

Caltrans recognizes that transportation is a leading contributor to GHG emissions in the region and is dedicated to reducing and mitigating transportation related emissions. We recommend collaborating with Caltrans on the following measures brought up by this plan increasing the use of zero emission vehicles, installing electric vehicle (EV) charging stations, identifying right-of-way areas to be used for carbon sequestration, and complete streets.

The existing climate hazards discussed in this document will have an impact of the transportation system. We recommend working with Caltrans on determining the preventative strategies the Caltrans can take to keep roadways operational and ensure their longevity against climate stressors such as increased temperatures, changes in precipitation patterns, wildfire, and flooding. Caltrans recognizes the central role that transportation planning plays in safety and ensuring that when these natural hazards do occur, citizens have a reliable evacuation route.

Right-of-Way
Per Business and Profession Code 8771, perpetuation of survey monuments by a licensed land surveyor is required, if they are being destroyed by any construction.

Any work performed within Caltrans' R/W will require discretionary review and approval by Caltrans and an encroachment permit will be required for any work within Caltrans' R/W prior to construction. As part of the encroachment permit process, the applicant must provide approved final environmental documents for this project, corresponding technical studies, and necessary regulatory and resource agency permits, specifically, the California Environmental Quality Act (CEQA) determination or exemption.

If you have any questions or concerns, please contact Roger Sanchez, LDR Coordinator, at (619) 987-1043 or by e-mail sent to roger.sanchez-rangel@dot.ca.gov.

Sincerely,

Kimberly D. Dodson

Kimberly D. Dodson, G.I.S.P.
Acting Branch Chief
Local Development Review

February 19, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Air Quality, Hydrology/Water Quality, Wetland/Riparian
Resident Name: Candance Youngberg
Resident City/Town: Bombay Beach

Scoping Comments:

Hello, my name is Candance Youngberg and I am a resident of Bombay Beach. I am writing you because I am scared that one of the results from the lithium mining will be a greater reduction of water in the Salton Sea. I would like to know what data you have that will show this not happens.

If the sea recedes more, the air quality will worsen and our town is already suffering a lot from this. The more water goes away the faster the playa gets exposed, the more particles in the air. If the water goes away, Bombay Beach DIES!

An alternative might be a way to figure out a solution in water loss is to get snow melt and all the water released by reservoirs to find its way down this way.

February 19, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Aesthetics, Agriculture and Forestry, Air Quality, Biological Resources, Cultural resources, Cumulative Effects, Drainage/Absorption, Geology/Soils, Hazards and Hazardous Materials, Land Use/Planning, Noise, Population/Housing
Resident Name: Carolyn Weiner
Resident City/Town: Bombay Beach

Scoping Comments:
I am Carolyn Weiner, I am writing as a long time visitor and lover of the salton sea and bombay beach community. My concerns with the lithium mining are as follows:

How will the lithium mining project address potential water and soil erosion, and how that will affect the water levels and the neighborhood

What measures are being implemented to protect the community from health risks associated with exposure to dust and chemicals used in the mining process?

What strategies will be employed to mitigate noise and dust pollution from the mining operations to maintain the quality of life for local residents?

Can you provide details on how the lithium mining is expected to impact the local economy and community, including job creation, potential displacement of local businesses, and changes in living costs.

Has there been an assessment on how the mining operations might impact local property values, and what, if any, measures are in place to protect homeowners?

Community Impact: What steps are being taken to ensure the mining project supports the social fabric and dynamics of our neighborhood, addressing potential conflicts and ensuring community benefits?
This area is more alive now than it has been since its development. There is a solid community that loves this area. The more information you can provide the better so people are not afraid for their health, their finances, and well being.

Keegan Kingsbury

From: Charlene Woodcock <charlene@woodynet.net>
Sent: Monday, February 12, 2024 7:57 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

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Thank you.

Sincerely,
Charlene Woodcock
2355 Virginia St
Berkeley, CA 94709

February 19, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Aesthetics, Air Quality, Biological Resources, Cultural resources, Cumulative Effects, Hazards and Hazardous Materials, Vegetation, Wetland/Riparian
Resident Name: Charles Philipp

Scoping Comments:
I am concerned about the environmental impacts and do not believe any mining should take place without a proper impact study

February 20, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Aesthetics, Agriculture and Forestry, Air Quality, Biological Resources, Cultural resources, Cumulative Effects, Drainage/Absorption Geology/Soils, Hazards and Hazardous Materials, Hydrology/Water Quality, Land Use/Planning, Mineral Resources, Noise, Population/Housing, Public Services, Recreation, Schools/Universities, Septic System, Sewer Capacity/Solid Waste, Transportation, Vegetation, Wetland/Riparian, Wildfire, Other
Resident Name: Christopher J Gallo

Scoping Comments:
Where will all the water come from that the plants need to do their process? Seems impossible. What if they get the water rights then decide it is not enough and abandon the project. Then what will happen? What is the strategy if they take up shop elsewhere? Will they still own the water rights even if they abandon the project?

Specifically, how are you using the 20% tab allocation for the communities?
If they are going to build more plants how do you keep them from contaminating the water tables as they are drilling?

How do you plan on distributing the 80% of the tax dollars and where? Specifically.
In the future, will they be able to use salt water for the operating plants and if so where will that come from?

What is the impact on the migratory birds?

What are your plans to refill the salton sea in order to control the dust? What is the impact of the lithium mines/plants and the receding shoreline and the toxic dust that is continuing to be exposed and cause lung issues. ? How will this be remedied?

Keegan Kingsbury

From: Cinda Johansen <ccjohansen@sbcglobal.net>
Sent: Monday, February 12, 2024 1:09 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

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Thank you.

Sincerely,
Cinda Johansen
348 Parker Dr
Folsom, CA 95630

Keegan Kingsbury

From: Colleen Auernig <colleen@auernig.com>
Sent: Friday, February 16, 2024 12:05 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

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Thank you.

Sincerely,
Colleen Auernig
147 gold creek circle
Folsom, CA 95630

Keegan Kingsbury

From: Craig Collins <ccollins@igc.org>
Sent: Monday, February 12, 2024 1:44 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

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Thank you.

Sincerely,
Craig Collins
1319 Milvia St.
Berkeley, CA 94709

CALIFORNIA STATE LANDS COMMISSION
100 Howe Avenue, Suite 100-South
Sacramento, CA 95825-8202

JENNIFER LUCCHESI, *Executive Officer*
916.574.1800
TTY CA Relay Service: **711** *or Phone* **800.735.2922**
from Voice Phone **800.735.2929**
or for Spanish **800.855.3000**

Established in 1938

February 20, 2024

File Ref.: 2023120104

Jim Minnick
Imperial County Planning and Development Department
801 Main Street
El Centro, CA 92243

SENT VIA EMAIL ONLY: jimminnick@co.imperial.ca.us

Subject: Notice of Preparation for a Draft Programmatic Environmental Impact Report for the Lithium Valley Specific Plan Project, Imperial County

Dear Mr. Minnick:

The California State Lands Commission (Commission) staff has reviewed the subject Notice of Preparation (NOP) for a draft Programmatic Environmental Impact Report (PEIR) for the Lithium Valley Specific Plan Project (Project), which is being prepared by Imperial County (County). The County, as the agency with primary review of the Project, is the lead agency under the California Environmental Quality Act (CEQA) (Pub. Resources Code, § 21000 et seq.). The Commission will act as a trustee agency because of its duty as the trustee of school lands to monitor projects that could directly or indirectly impact these lands. Commission staff requests that the County consult with us on preparation of the Draft PEIR as required by Public Resources Code section 21104, subdivision (a), and the State CEQA Guidelines section 15086, subdivisions (a)(1) and (a)(2).

Commission Jurisdiction and School Lands

In 1853, the U.S. Congress granted to California nearly 5.5 million acres of land for the specific purpose of supporting public schools. These lands are known as "school lands." In 1984, the State Legislature passed the School Land Bank Act (Act), which established the School Land Bank Fund (SLBF) and appointed the Commission as its trustee (Pub. Resources Code, § 8700 et seq.). The Act directed the Commission to develop school lands into a permanent and productive resource base for revenue generating purposes. The Commission manages approximately 462,830 +/- acres of school lands still held in fee

ownership by the state and the reserved mineral interests on an additional 790,000± acres where the surface estates have been sold. Revenue from school lands is deposited in the State Treasury for the benefit of the Teachers' Retirement Fund (Pub. Resources Code, § 6217.5).

State Lands/Mineral Interests

The State lands within the Lithium Valley Planning Area are a combination of fee-owned and reserved mineral interests (RMI) school lands, as listed here:

State Fee-owned Lands –

1. Forty acres (APN 020-010-030-000) in the Southeast 1/4 of the Southeast ¼ of Section 14, Township 11 South, Range 13 East, San Bernardino Baseline and Meridian, which were acquired by the State (Commission) from Imperial Irrigation District pursuant to a title exchange under Public Resources Code section 6307 (SLL 10), subject to: (1) a right of way for a drain channel over that portion of said lands included within a strip of land 80 feet in width, the center line of which is the center line of the "o" drain as now constructed, as reserved by said district; and (2) all easements and rights of ways of record in the name of or theretofore used by Imperial Irrigation District for irrigation, waste or drainage canals, et al, as reserved by said district.

Please note that this parcel is currently subject to a unitized geothermal resources lease issued by the Commission to Hudson Ranch I Holdings LLC (Lease 9000).

State 100 percent RMI Lands –

1. Eighty acres known as Parcel No. 241-553 (APN 020-010-040), in the East 1/2 of the Northeast ¼ of Section 16, Township 11 South, Range 13 East, San Bernardino Baseline and Meridian, (which were acquired by the Commission and patented as school lands, with 100 percent minerals reserved. The State Patent was issued to the Imperial Irrigation District, dated 2/9/1962. These lands are covered by the waters of the Salton Sea.

2. Forty acres known as Parcel No. 240-573 (APN 003-220-012), which is in the Northwest 1/4 of the Northwest 1/4 of Section 36, Township 10 South, Range 13 East, San Bernardino Baseline and Meridian, which were acquired by the Commission and patented as school lands, with 100 percent minerals reserved. The State patent was issued 2/21/1958. The surface owner is the California Department of Fish and Game, and the lands are within the Wister Unit of the Imperial State Wildlife Area.

State 1/16th RMI Lands –

1. Forty acres known as Parcel No. 240-575 (APN 003-230-035), which is in the Northwest 1/4 of the Northwest 1/4 of Section 32, Township 10 South, Range 14 East, San Bernardino Baseline and Meridian, which were acquired by the Commission and patented as Lieu Lands, with a 1/16th interest in the minerals reserved to the State.
2. Forty acres known as Parcel No. 240-574 (APN 003-230-065, 066 and Por. of 054), which is in the Northeast 1/4 of the Northwest 1/4 of Section 32, Township 10 South, Range 14 East, San Bernardino Baseline and Meridian, which were acquired by the Commission and patented as Lieu Lands, with a 1/16th interest in the minerals reserved to the State.

Should any future projects be considered that would include the areas noted above, an application will need to be submitted to the Commission so that a determination may be made as to the type of permit, lease, or other authorization that would be required. Please contact Vanessa Perez for further information (see contact information below).

Project Description

The Project is intended to provide a framework and guidance for, and streamline the development and permitting of, additional renewable energy infrastructure and facilities, mineral recovery, lithium battery manufacturing, and other renewable industries within an approximately 51,786-acre area adjacent to the Salton Sea. The Project aims to facilitate the existing and future renewable energy development, lithium extraction, associated infrastructure, commercial, and related manufacturing industries investment that provides quality local jobs, while minimizing adverse effects on the environment and public health.

Environmental Review

Commission staff requests that the following potential impacts be analyzed in the PEIR.

General Comments

1. Programmatic Document: Because the EIR is being proposed as a programmatic rather than a project-level document, the Commission expects the Project will be presented as a series of distinct but related sequential activities (i.e., particular proposed actions). The State CEQA Guidelines, section 15168, subdivision (c)(5) states that a program EIR will be most helpful in dealing with subsequent activities if it deals with the effects of the program as specifically and comprehensively as possible. In order to avoid the improper deferral of mitigation, a common flaw in program-level environmental documents, mitigation measures should either be presented as specific, feasible, enforceable obligations, or should be presented as formulas containing "performance standards which would mitigate the significant effect of the project, and which may be accomplished in more than one specified way" (State CEQA Guidelines, § 15126.4, subd. (a)). As such, the program EIR should make an effort to distinguish what activities and mitigation measures related to renewable energy infrastructure and facilities, mineral recovery, lithium battery manufacturing, and other renewable industries are being analyzed in sufficient detail to be covered under the program EIR without additional project specific environmental review, and what future land development activities will trigger the need for additional environmental analysis (see State CEQA Guidelines, § 15168, subd. (c)). For example, if the County anticipates relying upon the PEIR for future approvals related to the Hell's Kitchen Powerco 1 and Lithiumco 1 Project (SCH 2022030704), then the PEIR must include a detailed description of associated Project activities, impacts, and mitigation measures that were not previously analyzed and that would occur within the Lithium Valley Planning Area.

2. Project Description: A thorough and complete Project Description should be included in the PEIR in order to facilitate meaningful environmental review of potential impacts, mitigation measures, and alternatives. The Project Description should be as precise as possible in describing the details of all allowable activities (e.g., sample land development activities for each identified area in the Specific Plan, types of equipment or methods that may be used, maximum area of impact or volume of soil removed or disturbed, seasonal work windows, locations for material disposal, etc.), as well as the

details of the timing and length of activities. Thorough descriptions will facilitate Commission staff's determination of the extent and locations of its jurisdiction as well as make for a more robust analysis of both Program- and Project-level work that is being evaluated in the PEIR.

Biological Resources

3. Sensitive Species: The area encompassed by the Project includes habitat for several sensitive or special status species that could be affected by construction depending on the time of year. In order to ensure the PEIR is as complete and thorough as possible in disclosing and analyzing potential impacts to biological resources, the County should conduct queries of the California Department of Fish and Wildlife's (CDFW) California Natural Diversity Database (CNDDB) and U.S. Fish and Wildlife Service's (USFWS) Special Status Species Database to identify any special status plant or wildlife species that may occur in the Project area. In addition, the County should initiate consultation with the above agencies to ensure the information is current and accurate. The PEIR should analyze the potential for such species to occur in the Project area and, if impacts to special status species are found to be significant, identify mitigation measures that would avoid or lessen the impact to the extent feasible.

Climate Change

4. Greenhouse Gas (GHG): A GHG emissions analysis consistent with the California Global Warming Solutions Act (Assembly Bill [AB] 32; Nuñez, Chapter 488, Statutes of 2006) and required by the State CEQA Guidelines should be included in the PEIR. This analysis should identify a threshold for significance for GHG emissions, determine whether future land development activities may exceed that threshold, and identify programmatic mitigation measures that would reduce the emissions to less than significant levels.

Hydrology

5. Groundwater: If the County anticipates relying upon the PEIR for lithium extraction projects, then the PEIR should analyze whether the development and operation of projects within the Specific Plan area could result in potentially significant impacts to groundwater supplies. Analysis should include off site directional drilling that may require groundwater during construction. Therefore, Commission staff request that the PEIR clarify the amount of groundwater lithium extraction projects would require and whether future projects would impede groundwater basin management.

Environmental Justice

6. In 2018, the Commission adopted an Environmental Justice Policy. In this policy the Commission envisions a future in which environmental justice (EJ) communities are no longer disproportionately impacted by pollution or environmental hazards. The Initial Study does not contain a separate EJ Discussion; however, EJ is part of the County's general plan policies, specifically objective 3.7, which requires the County to evaluate environmental justice issues associated with job creation and displacement when considering the approval of renewable energy projects. According to CalEnviroScreen 4.0, the Specific Plan area includes a disadvantaged community as identified under Senate Bill (SB) 535 (De León, 2012). In addition, public concerns have been raised about the unknown public health impacts of lithium extraction and associated pollution burdens to nearby disadvantaged communities, including the impacts of chemicals used to separate lithium from the geothermal brine, and the potential link between geothermal activities at the Salton Sea and recent earthquakes. In light of these public concerns, Commission staff appreciate the ongoing efforts of the County through the creation of the Environmental Justice Working Group and respectfully request that information be included in the PEIR regarding impacts to adjacent disadvantaged communities due to Project implementation.

Additional Review

7. Deferred Mitigation: In order to avoid the improper deferral of mitigation, mitigation measures (MMs) must be specific, feasible, and fully enforceable to minimize significant adverse impacts from a project, and "shall not be deferred until some future time." (State CEQA Guidelines, §15126.4, subd. (a)). For example, references to the preparation of a plan to reduce an impact, without calling out the specific activities that will be included in the plan to reduce that particular impact to a less than significant level, is considered deferral. Commission staff requests that specific information be provided in such MMs to demonstrate how the MM is going to mitigate potential significant impacts to less than significant.

Thank you for the opportunity to comment on the NOP for the Project. As a trustee agency, the Commission requests that you consult with us on this Project and keep us advised of changes to the Project Description and all other important developments. Please send additional information on the Project to the Commission staff listed below as the PEIR is being prepared.

Please refer questions concerning environmental review to Cynthia Herzog, Senior Environmental Scientist, at (916) 574-1310 or via email at cynthia.herzog@slc.ca.gov. For questions concerning Commission jurisdiction, please contact Vanessa Perez, Senior Mineral Resources Engineer, at (562) 256-1524 or via email at vanessa.perez@slc.ca.gov.

Sincerely,

Nicole Dobroski, Chief
Division of Environmental Science,
Planning, and Management

cc: Office of Planning and Research
C. Herzog, Commission
V. Perez, Commission
M. Wiemer

February 15th, 2024

Jim Minnick
ICPDS, Director

Subject: NOI Initial Study Imperial County Lithium Valley Specific Plan

Dear Mr. Minnick,

On behalf of Hell's Kitchen Geothermal, LLC (HKG), a subsidiary of Controlled Thermal Resources (US), Inc. (CTR) please find comments related to the Notice of Intent for the Imperial County Lithium Valley Specific Plan (LVSP) Initial Study. HKG proposes the construction and operation of a geothermal power facility (HKP1) and commercial lithium hydroxide production plant (HKL1) thru the approved Conditional Use Permits #21-0020 PowerCo1 and #21-0021 LithiumCo1 respectively. We are providing comments to the Proposed Land Use per LVSP Initial Study and LVSP Figure 2:

1. Recreation easement conflicts with approved geothermal facilities within CTR property area.
    a) Recommendation: Shift south Hazard, Hazard is farther removed from CTR property area and approved developments.

2. North-west "conservation" land use area in between W drain and U drain contains areas designated for potential mitigation and well pad sites.
    a) Recommendation: designate the area west of Davis Road, between W and U drain "playas renewables." "Conservation" would impede any well pad and mitigation development.

3. The closest transportation hub is miles from the CTR property area where 7,000 jobs could be created.
    a) Recommendation: Add an east-west rail spur on Pound or Noffsinger that extends to Davis Road.

4. Playa renewables designation extends into areas intended for future green industrial use.
    a) Recommendation 1: Extend 'Future Green Industrial' zone west to Salton Sea
    b) Recommendation 2: Provide option for 'Manufacturing' and 'Logistics' overlay on Future Green Industrial zone.

5. Consider all CTR property area for the initial development phase of the Lithium Valley land use designation.

Thank you for considering these comments and supporting development of the Lithium Valley.

Kind Regards,
Sergio Cabanas, EHS Director

Cc: Jim Turner, President
Rob Moore, COO

Keegan Kingsbury

From: Cat Cole <cara.cene@icloud.com>
Sent: Saturday, February 17, 2024 9:14 AM
To: Jim Minnick
Cc: Imperial Coalition; Daniela Flores
Subject: Public comment lithium steps

CAUTION: This email originated outside our organization; please use caution.

Comments ;

- dust mitigation is non existent despite the efforts this was said to not be a concern for the new people to work or live in the area
- the water not going to the sea is not ok if dust mitigation is required by the state lawsuit with IID .
- water from natural disasters keeps enabling lives and not getting to the sea… we need the delta to be able to flow into the sea as nature is trying to do.
- the past injection to fill the wondering geyser caused more ground activity than the volcano's are creating already how is this not going to cause devastating seismic activity like the past that caused ground fires from vents to ignite wildfires .
- there's no hospitals or actual emergency response how can more people be brought here to die.
- in Bombay the pm10 monitor has been down for month decreasing the public trust in information while people are choking though the windy nights.
- the slowjamastand and by sandy beach has blooms of gypsum from a unknown volcanic source how do you know the activity of messing with the veins isn't making more volcanos rise
- how will the water injections actually effect the composition of the lava flow exactly to my knowledge when you take something away filling it with water doesn't magically make what it was.
- how is this not going to make sink holes after the pumping is done?
- what will happen in 30 years when their done will they be geothermal again or abandon the buildings like the oil pumps through la county.
- how will the farmers stay if they have no people to pick the fields due to the dust and the gov trying to take away iid water rights due to flooding the fields for lithium ?
- how will this not be another depression when the cash crops don't sell and everyone is running for the lithium hill like the ides of liquid gold freedom
- has there been a economic/ diversity/ social environment report?

Thank you for reading,
Czar Apothecara

February 20, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern:
Resident Name: Daniel Guerrero

Scoping Comments:

Daniela Guerrero, retired. My concern is for the local wildlife which is dependant on the environment, wetlands, the Salton Sea, and their surrounding desert area. The wildlife and their habitat should be disturbed as little as possible. Destruction of the habitat would have a direct impact on the local wildlife. A plan for reducing the impact on the environment and wildlife. Displaced wildlife may not survive. Find a method to commit the most minimal impact.

February 19, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Air Quality, Transportation, Water Quality, Other
Resident Name: Dave Day
Resident City/Town: Bombay Beach

Scoping Comments:

I live in Bombay Beach and I am concerned with the freshwater consumption that these new developments will be using for this project. This community already struggles to pay the high water bills and now that we are competing with Lithium Companies I want to make sure that our communities are not financially impacted by this increased use of water. Please study how much water these companies will be using and how it will affect the community monetarily and their livelihoods. Please find an alternative that won't impact the community.

I am also worried about the increased traffic that these developments will cause, increasing the bad air quality and further damaging the poor infrastructure in our communities. If these developments will be transporting any hazardous waste and lithium through our community I am worried that their vehicles will worsen the air quality and disturb the roads that are already in need of fixing. Please study how this increased traffic with hazardous materials and/or lithium will affect our air quality and roads. Please find an alternative that decreases the impact of air quality and infrastructure damages to our roads caused by increased vehicle traffic.

Keegan Kingsbury

From: CASAS VEJER DEBRA CASA PUERTA AZUL <debraberger.net@gmail.com>
Sent: Tuesday, February 20, 2024 4:00 AM
To: Jim Minnick
Subject: Lithium environmental impact

Dear Mr. Jim Minnick,
On behalf of myself, Debra Berger, part time , resident of Bombay Beach, I am pleased to offer scoping comments for Imperial County's Program Environmental Impact Report (PEIR) for the proposed Lithium Valley Specific Plan Project (Project) (SP22-0001). We understand that the Lithium Valley Specific Plan and PEIR is intended to provide a framework and guidance for the necessary infrastructure and facilities and streamline the development and permitting of additional renewable energy facilities, mineral recovery, lithium battery manufacturing, and other renewable industries within an approximately 51,786-acre area adjacent to the Salton Sea. Currently, the Imperial County Planning & Development Services Department is seeking the community's comments about the effects this project might have on the environment and suggestions as to alternatives, mitigation or ways the project may be revised to reduce or avoid any significant environmental impacts. I, your name here, would like to recommend that the following topics be analyzed in the PEIR: Aesthetics Agriculture and Forestry Resources Air Quality Biological Resources Cultural Resources Cumulative Effects Drainage/Absorption Geology/Soils Hazards & Hazardous Materials Hydrology/Water Quality Land Use/Planning Mineral Resources Noise Population/Housing Public Services Recreation Schools/Universities Septic System Sewer Capacity Solid Waste Transportation Vegetation Wetland/Riparian Wildfire The future levels of the Salton Sea body of water The long term plan to prevent stranded infrastructure Overall project cleanup agenda Making sure that cleanup costs don't fall upon the town/county/state people and taxpayers The companies involved will be held responsible for any environmental disaster, no matter how big or how small. These topics listed above are of great concern because of the environmental impact that it will have on myself, my property, and the surrounding community, be it direct, indirect, or cumulative impacts. The analysis should consider the impacts of these topics because of the importance of the impact on the geography, and affected populations within Imperial County. Thank you for taking the time to consider my suggested topics for analysis. I am looking forward to seeing my comments reflected in the draft of the Programmatic Environmental Impact Review for the Lithium Valley Specific Plan.
Best regards,
Debra Berger part time Resident of Bombay Beach, CA

Keegan Kingsbury

From: Dennis Trembly <trembly@usc.edu>
Sent: Monday, February 12, 2024 1:09 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

This analysis should carefully consider cumulative impacts on the entire Imperial County Air Pollution Control District, which is already severely degraded. Any worsening air quality would significantly impact public health and likely exceed legal thresholds, which must be analyzed and mitigated. Given these concerns, please consider a project alternative requiring no reduced inflow to the Salton Sea.

Thank you.

Sincerely,
Dennis Trembly
27616 Longhill Drive
Rancho Palos Verdes, CA 90275

Keegan Kingsbury

From: Diana Bohn <nicca@igc.org>
Sent: Monday, February 12, 2024 4:15 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

This analysis should carefully consider cumulative impacts on the entire Imperial County Air Pollution Control District, which is already severely degraded. Any worsening air quality would significantly impact public health and likely exceed legal thresholds, which must be analyzed and mitigated. Given these concerns, please consider a project alternative requiring no reduced inflow to the Salton Sea.

Thank you.

Sincerely,
Diana Bohn
618 San Luis Rd
Berkeley, CA 94707

February 19, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Agriculture and Forestry, Air Quality, Biological Resources, Cumulative Effects, Drainage/Absorption, Geology/Soils, Hazards and Hazardous Materials, Land Use/Planning, Population/Housing, Vegetation, Wetland/Riparian
Resident Name: Dulcinée DeGuere
Resident City/Town: Bombay Beach

Scoping Comments:
My name is Dulcinée, I'm a part-time resident of Bombay Beach, and I'm concerned about the possible environmental impacts of Lithium mining. Chiefly, I'm most concerned about the large amount of water use required to perform lithium mining, and the pollution. I'm also concerned about the potential increase in carbon dioxide emissions, the production of large quantities of mineral waste, increased respiratory problems for the people who live in the surrounding areas, and alteration of the hydrological cycle. The Salton Sea is already suffering greatly from cuts in water inflow, and if more water is directed away from the Sea and to lithium mining, the environmental catastrophe will be exacerbated.

EARTHWORKS

February 20, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Via email: DianaRobinson@co.imperial.ca.us and jimminnick@co.imperial.ca.us

Re: Scoping Comments on Proposed Lithium Valley Specific Plan and Program Environmental Impact Report

Dear Ms. Robinson and Mr. Minnick,

Please find below scoping comments to inform the Draft Programmatic Environmental Impact Report (PEIR) for the Lithium Valley Specific Plan, submitted by Earthworks and experts from Comite Civico del Valle's Lithium Valley Equity Technical Advisory Group.

Earthworks is an environmental nonprofit organization that protects communities and the environment from the adverse impacts of mineral and energy development while promoting sustainable solutions. We're driven by our commitment to collaborate with communities on the frontline, using science in innovative ways, and building people power to ensure a more just and livable future. For the past two years we have worked with Comite Civico del Valle and communities in Imperial County to better understand the impacts of proposed lithium extraction projects.

The Lithium Valley Equity Technical Advisory Group collaborates with Comite Civico del Valle and the Lithium Valley Community Coalition on:

- Reviewing of the scientific and legal literature to guide the development of a research agenda for the expansion of a circular lithium economy based in the Imperial Valley, with requirements for environmentally responsible raw material sourcing, refinement, and product design that supports material recovery, reuse, and recycling.
- Surveying Lithium Valley stakeholders to identify priorities that can contribute to government and academic research goals, while emphasizing participatory research models for community engagement and action.
- Connecting technical support to strengthen environmental and health mitigation measures in the preparation of Imperial County's Lithium Valley Programmatic Environmental Impact Report for local stakeholders.
- Executing research/analysis that can support community benefit projects and agreements, in addition to educational pathways for a skilled and trained workforce, including internships, apprenticeships, certificate, and degree programs for Imperial Valley residents.

The Lithium Valley Specific Plan and PEIR is an important opportunity for Imperial Valley to lead on a just energy transition. This has the potential to be a key baseline because geothermal direct lithium extraction (DLE) technology is still not proven at a commercial scale, and there are several unknowns about the cumulative impacts of the proposed development. A thorough PEIR is needed to ensure that the development of Lithium Valley does not lead to unacceptable environmental impacts.

Dedicated to protecting communities and the environment from the adverse impacts of mineral and energy development while promoting sustainable solutions.

1612 K St. NW, Suite 904
Washington, DC 20006
202.887.1872
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earthworksaction
@earthworks

EARTHWORKS

Lithium is considered a "critical" or "transition" mineral for reducing global reliance on fossil fuels, and geothermal DLE may be designed to be more sustainable than conventional lithium extraction methods of open pit mining or evaporation ponds. However, the Salton Sea region has a long history of environmental degradation, and questions remain about the sustainability of this novel technology.[i] Disadvantaged communities in the region have extraordinary exposure to public health hazards, particularly due to pesticide drift and air pollution. Residents near the Salton Sea have increased rates of adolescent asthma hospitalizations as a result of the rapid recession of the sea, which causes vulnerability to toxic dust from the exposed shoreline (referred to locally as the *playa*).[ii] The urgent need for environmental justice and ecological restoration demonstrate that while renewable energy and mineral resource development may appear to meet state and federal climate action goals, it must not render the Salton Sea region a "green sacrifice zone" by perpetuating unresolved environmental problems or creating new ones.[iii]

We have been conducting community-engaged research on environmental justice issues relating to the development of Lithium Valley and hold expertise in a variety of related fields. Our CVs are already on file with the County from previous comment periods in this planning process. We hope that our comments will be helpful in developing the scope of the PEIR and ensuring that Lithium Valley is built in a just and sustainable way. In what follows we offer suggestions for further consideration of: (1) Alternatives; (2) Impacts; and (3) General Comments.

Sincerely,

Jared Naimark
California Mining Organizer
Earthworks
Email: jnaimark@earthworksaction.org

James J. A. Blair, PhD
Associate Professor, Department of Geography and Anthropology
Cal Poly Pomona
Email: jblair@cpp.edu
Phone: 781-856-7269

Kate Berry, PhD
Professor, Department of Geography
University of Nevada, Reno
Email: kberry@unr.edu

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Alida Cantor
Associate Professor, Department of Geography
Portland State University
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Dustin Mulvaney, PhD
Professor, Department of Environmental Studies
San José State University
Email: dustin.mulvaney@sjsu.edu
Phone: 831-247-3896

Ali Sharbat, PhD, PE
Professor, Department of Civil Engineering
Cal Poly Pomona
Email: sharbat@cpp.edu
Phone: 909-869-2175

Toni Symonds
Principal, Policy Works California
Email: toni.symonds@gmail.com

Dedicated to protecting communities and the environment from the adverse impacts of mineral and energy development while promoting sustainable solutions.

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earthworksaction
@earthworks

1. Alternatives

The Specific Plan and PEIR must analyze a range of alternatives. The County has provided some land use alternatives and identified a preferred alternative, but we are still in the scoping stage, so CEQA requires that the County consider alternatives proposed through public comments. Please study the following alternatives:

a) No hydrogen or biomass alternative

The land use category "Green Industrial" defines allowed uses as including, but not limited to "geothermal energy production and mineral recovery, biofuel generation, and green hydrogen. Ancillary uses may include, but not limited to, supportive manufacturing, commercial, logistics, and battery manufacturing and storage." However, biofuel generation and green hydrogen have nothing to do with lithium extraction. SB 125 funded the county to prepare a program EIR "for geothermal energy development and lithium extraction, processing, production, and related manufacturing activities within the county." Biofuel generation and green hydrogen may have industry-specific adverse impacts that merit their own project-by-project CEQA analysis, not streamlining under the program EIR meant for geothermal lithium.[iv] The description of the Project in the Initial Study includes geothermal and solar, as well as lithium (and associated industrial uses and infrastructure improvements). Biofuel and hydrogen are not included here, even though they are included in the land use alternatives. They are arguably outside the scope of Lithium Valley, and so should not be able to tier off of the Lithium Valley PEIR. Instead, these hydrogen and biomass projects must be analyzed separately to ensure impacts are mitigated, and require real monitoring.

b) Water conservation with no reduced inflow to Salton Sea alternative

The Specific Plan proposes converting agricultural land to industrial uses. The Salton Sea currently receives water through agricultural drainage. Converting this farmland would then reduce the inflow to the Salton Sea, speeding up the recession of the sea and exposure of playa, leading to an indirect impact on air quality.[v] Please study an alternative that requires no reduced inflow to the Salton Sea. Onsite water conservation measures should be considered, including implementing water treatment and recycling systems to reuse processed water. So too, any reduction of inflow to the Salton Sea must be considered a significant impact that is mitigated to the fullest extent, including means/incentives to reduce project-specific water demand–such as public benefit fee tied to a project's water usage, to fund water conservation projects.

c) No brine pond alternative

Brine ponds represent one of the potential sources of hazardous waste and emissions at geothermal and lithium facilities. Alternatives should be considered for onsite waste handling and storage, such as: (i) above-ground, sealed storage containers to prevent spills and wind-blown contaminants; (ii) effectively covered to minimize emissions; and/or (iii) covered solar to generate further onsite renewable energy that could serve as an alternative to diesel generation.

d) Integration of geothermal and solar energy with agriculture alternative

A more integrated alternative combining geothermal and solar energy with agriculture may allow for maximizing food, energy, and water co-benefits and minimizing the loss of land and jobs for community and industry stakeholders. There is already consideration of ancillary uses of solar photovoltaic (structured or floating) in the land use alternatives in "playas renewables" and "playas restoration." Floatovoltaics tend to help reduce water evaporation and algae growth, and these are critical concerns for agricultural runoff leading to the Salton Sea, which has already been degraded due to receding water levels and algae blooms. Nonetheless, canals in Imperial Valley also provide important habitat for special status species, including burrowing owls and desert pupfish. Given the need to protect these fragile biological resources surrounding canal systems and playas, it is worth considering other alternatives that would maximize synergies with solar and geothermal energy projects, for

example integration of geothermal processes within organic solar cell greenhouses.[vi] If safeguards are in place for environmental health and food safety, zero energy greenhouses fitted with semi-transparent organic solar cells could be enhanced with geothermal steam condensate and ammonia for vegetable growth, resulting in a more biodiverse matrix with less reliance on alfalfa exports as the primary monocrop system in Imperial Valley.[vii] Cooling tower fluid (condensed steam with ammonia) from geothermal facilities may be used as an agricultural enhancement to water plants, dry vegetables and improve soil.[viii] Direct uses of solar and geothermal energy may also help to lower energy costs related to farming, while reducing our dependence on fossil fuels. Such integration of renewable energy with agriculture may help the region mitigate and adapt to climate change. An alternative that would study the feasibility of this concept and analyze the regulatory challenges for such co-location of renewable energy with agriculture may help resolve tradeoffs and conflicting land uses due to conversion of agricultural land.

e) Circular waste management alternative

Even though it is considered a closed-loop and renewable source of energy, geothermal energy production generates considerable amounts of solid waste that is usually sent to a landfill or hazardous waste facility. The industry anticipates generating significantly more iron-silica filter cake material as a result of lithium extraction. A cradle-to-cradle approach to circular waste management may help divert solid waste from landfills and hazardous waste facilities. For example, geothermal solid waste may be synthesized into mesoporous silica, which is a material that may be used in a variety of industries—including energy and mineral resources—as catalysts, adsorbents, ion exchangers, optic materials, and solar panels.[ix] Zeolites can also be synthesized from geothermal waste for secondary uses as agricultural water cleanup and as a soil amendment.[x] Zeolites are porous aluminosilicate crystals with agricultural use as a soil amendment to improve water retention of the soil, increase water infiltration, and reduce nitrate leaching.[xi] The high porosity of zeolites allows for up to a 60 percent increase in weight through water adsorption, which is released slowly over time allowing for more efficient water use and drought tolerance. Given that water resources from the Colorado River are increasingly limited, zeolites could allow for more efficient use of water. The porous structure of zeolites also allows for adsorption of pollutants such as nitrate and ammonia from water, and potentially hazardous heavy metals like lead found in geothermal waste.

f) Southeast Lake Cahuilla Active Volcanic Cultural District alternative

The preferred Land Use Alternative currently collapses Tribal cultural resources with Salton Sea restoration as features of Conservation or Playas Renewable and Restoration areas. These may be incompatible land uses, and alternatives have already been proposed by the Native American Land Conservancy and Tribal elders like Carmen Lucas (Kwaaymii Laguna Band of Indians) to protect Tribal cultural resources as part of a new cultural district. This would include Obsidian Butte, new and old mudpots, Mullet Island, Red Hill, and Rock Hill. Please refer to comments submitted by Carmen Lucas and legal counsel Courtney Ann Coyle for specific details of this promising alternative. Alternatives should consider appropriate setbacks comparable to other similarly sensitive Tribal cultural resources considered sacred sites in other resource development sites, e.g. Chaco Canyon or Mauna Kea.[xii] Obtrusions on the viewshed should be identified on a map in consultation with Tribal monitors to properly represent and protect the cultural landscape. Regarding the County's claim that they have contacted all Native American Tribes in the area, it would be helpful to cite and discuss the specific requirements of AB 52 in addition to the codes cited (Dudek, 2023, p. 9), and provide more details on interactions with the Tribes listed in the section on Tribal cultural resources, especially considering that there have been egregious problems with lack of Tribal consultation in scoping for related geothermal and lithium projects in the area.

g) Cleaner Alternatives to Fossil Fuel Infrastructure

Please consider alternatives to diesel generators, such as solar on all buildings, above brine and water storage ponds, and canopies over parking lots. Planning should be in place for documenting and verifying zero energy

buildings with no onsite natural gas. Alternatives should consider scenarios for the acquisition and use of electric vehicles (EVs), including trucks and off-road vehicles, as well as necessary heavy-duty charging infrastructure.

2. Impacts

The DEIR must analyze reasonably foreseeable direct, indirect, and cumulative impacts in the following areas:

a) Freshwater consumption

The DEIR must thoroughly analyze cumulative impacts on freshwater supply. The Initial Study states phase 1 of the Specific Plan will use 100,000 AF (p. 47), but it's not clear where that estimation is coming from. Does this include the geothermal and lithium projects already going through permitting? Is this inclusive of potential water demands of manufacturing, storage and recycling? Methodology for estimating freshwater consumption must be fully elaborated in the DEIR with a water supply assessment that explains cumulative impacts. Establishment of a water supply taskforce may be necessary for delivering a comprehensive assessment.

As stated in the Initial Study, this 100,000 AF estimation far exceeds what remains available under the IID's non-agricultural water supply and "may result in substantial demands for water not currently accounted for in water planning in the region" (p. 48). The Initial Study states on page 48 that there is 22,8000 AFY water available. Presumably this was a typo and should say 22,800 and not 228,000. It remains unclear, though, why this figure from December 2021 is used and not more recent figures for water apportioned for non-agricultural uses. New proposed projects since then already surpass this apportionment. According to the Water Supply Assessment for the Hell's Kitchen project, as of November 2023, there was only 18,620 AFY remaining in the IWSP water supply. If you account for the Hell's Kitchen water use of 6,500 AFY, as well as the 13,165 AFY for the three proposed BHE power plants, this water supply is already over-drafted - at 19,655 AFY. The DEIR must include a clear accounting of where water will be supplied from, and what the impact will be, including in drought conditions, updated agreements and potential cuts to the use of water from the Colorado River.

Freshwater consumption–particularly cumulative impacts–must be addressed head-on. Water-intensive projects utilizing IID water supplies must be analyzed as related projects, such as the BHE power projects and the recently approved CTR Hell's Kitchen project.

Please study how the Specific Plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air. This analysis should carefully consider cumulative impacts on the entire Imperial County Air Pollution Control District, which is already severely degraded. Any worsening air quality would significantly impact public health and likely exceed legal thresholds, which must be analyzed and mitigated. The Initial Study states that a permit is needed for construction below 220-foot contour of Salton Sea (Dudek, 2023, p. 8). This contour should be linked to a water level that meets conservation and restoration goals, and it must not shift with the rapidly receding sea level. Also, this permit requirement applies to construction, but it should also apply to operations, including directional drilling for resources located beyond that level in deposits under the Salton Sea.

b) Hazardous waste from lithium extraction

Please study the type and amounts of hazardous waste that will be produced by lithium extraction plants within the Specific Plan Area, including an analysis of how waste will be stored, transported, and disposed of. This analysis should include the hazardous brine elements such as arsenic and lead that may precipitate out onto filter cakes as part of the Direct Lithium Extraction process. Iron-silica material generated during the lithium separation process may contain toxic or hazardous elements, including lead and arsenic. Scientists have linked exposure to arsenic to a variety of health problems, including heart disease, diabetes, and cancer of the bladder, lung, skin,

kidney, liver, and prostate. In children, lead can cause behavioral problems like hyperactivity, permanent learning difficulties, and reduced physical growth. Significant mitigation will be required to account for substantial risks from arsenic spills and lead-containing materials from facility blowouts, corrosion, abrasion, and possible accidents. Since each DLE project will use its own proprietary technology, waste streams may look different at each site, and so the DEIR should outline an adaptive management process to analyze and mitigate the risks of hazardous waste that come with each new lithium extraction proposal. The EIR must also analyze the risk of hazardous waste produced by the regular de-scaling process used for geothermal wells, as well as the risk of brine spills. The EIR should also require appropriate setbacks for schools, residential areas and community opportunity areas from lithium extraction.

c) Hazardous waste from battery manufacturing and recycling

The EIR must analyze impacts of hazards and hazardous materials from battery manufacturing and recycling that will occur within the Specific Plan Area. These industries pose specific risks that haven't been previously discussed by the Blue Ribbon Commission on Lithium Valley, or lithium-geothermal project permitting. In particular, the EIR should study:

- Potential impacts from fires at storage, manufacturing or recycling facilities or any facility containing large amounts of old or new lithium ion batteries
- Assess impacts from air pollution caused by battery manufacturing or recycling facilities that use incineration or cause hazardous air pollutants
- Consideration of prohibition on any recycling processes that involves the combustion or burning of end-of-life battery materials
- Risk to groundwater from potential battery separator manufacturers that may use trichloroethylene (TCE) or other solvents.

d) Seismic activity

Please analyze the risk of induced seismicity from additional geothermal drilling. How many new wells will be drilled under the Specific Plan, including directional drilling? What mechanism will be in place to monitor seismic activity? Will any of these use EGS? The EIR should require all projects built under the Specific Plan to utilize the highest standards for earthquake safety for construction and operation. The EIR should require completing and disclosing a geotechnical engineering investigation before continuing construction or drilling, including identifying all locations of directional drilling. The EIR should describe in detail site preparation, foundations and settlements, soil mixing, piles, concrete mixes and corrosivity, site fill, excavations, seismic designs, pavements and other relevant plans. It is critical that the EIR requires installing seismic monitoring systems to collect and report on real-time data. A process should be in place for monitoring/reporting incidents via public hotline/website for identified sinkholes and subsidence due to geothermal operations and reinjection. Establishment of a community advisory committee may be necessary to ensure compliance with this and the other aforementioned impacts. The EIR should also require earthquake preparedness training for workers within the Specific Plan Area, open to local community members.

e) Tribal Cultural Resources

- Tribal consultation – On P. 46 of the Initial Study, it claims that no Tribes have requested SB18/AB52 consultation yet. Among others, it has become clear that Carmen Lucas from the Kwaaymii Laguna Band of Indians has requested consultation based on several recent public comments (note: P. 45 lists the Kwaaymii Laguna Band of Mission Indians, but this is an error because "Mission" should be removed). Tribal members, including Cultural Committee members, Tribal elders and their legal counsel have all objected publicly to the lack of consultation in related projects that fall within Lithium Valley. Given this context, Imperial County should proactively engage with Tribes beyond the "check-box" requirements, to ensure all impacted Tribes have had the opportunity requested consultation.

- Cultural landscape beyond artifacts – It is critical to acknowledge not just the potential unearthing of archaeological artifacts and site-specific cultural resources during development, but also to provide relevant mitigation measures for obtrusion on a viewshed within a broader cultural landscape that includes nearby sacred sites, including mud pots, steam vents, Mullet Island, Rock Hill, Red HIll, and Obsidian Butte. (Obsidian Butte is not the only Tribal cultural resource within the Southeast Lake Cahuilla Active Volcanic Cultural District.) CEQA Guidelines indicate that even if a site is not listed, this does not mean it is not significant. In addition to a qualified archaeologist, a Tribal monitor should be included for monitoring of Tribal cultural resources. An inventory should be prioritized now, so the Draft PEIR can properly assess the impact to identified eligible resources and impose proper mitigation (e.g., avoidance, protection, in-lieu fees, access, etc.)

- Tribal monitors – The EIR should require Tribal monitors in addition to archaeologists so that the scope of cultural resources management is not limited to unearthing site-specific artifacts but rather is connected to the broader cultural landscape. Furthermore, visibility of warehouses, industrial facilities, and geothermal plumes will affect the viewshed of the surrounding cultural landscape.[xiii] The EIR must analyze and mitigate this aesthetic impact on cultural resources.. These monitors should be qualified (subject to tribal determination) and be tied to earth-moving activities (e.g., each earthmoving equipment)--with particular focus at the initial phases of construction.

- Landslides – The EIR must analyze the impact of landslides to Tribal cultural resources considered sacred sites, including Obsidian Butte, Rock Hill, and Red Hill (note that the latter is separate from, not "also known as Red Hill" as described in the Initial Study). Landslides most likely to occur in these places should be considered potentially significant impacts rather than "Less Than Significant Impacts." If the Initial Study designates Obsidian Butte as a "recognized sensitive resource to be protected," then mitigation measures should also be in place for Rock Hill and Red Hill, which are also included in the Southeast Lake Cahuilla Active Volcanic Cultural District. Alternatives for appropriate setbacks to provide buffer zones for these sensitive sacred sites should be provided. Given the close proximity of proposed development projects without setbacks in place yet, the localized and cumulative impacts that could result in landslides that would desecrate these sensitive Tribal cultural resources should be considered potentially significant impacts.

f) Loss of Jobs for Farmworkers

When considering the potentially significant impacts on conversion of agricultural land, it is important to consider changes to the environment, as well as the potential loss of jobs for farmworkers relative to the opportunity for jobs requiring different skills and training in new industrial sectors of Lithium Valley. In the last decade, Imperial County has already approved nearly 24,000 acres of solar development, primarily on agricultural land.[xiv] This has brought in more than $30 million for Imperial County, providing some public benefits, but it has also eliminated jobs for field laborers as well as associated California agriculture businesses. The EIR must analyze and mitigate the impact to agricultural jobs resulting from the Specific Plan. This is relevant to any overriding statement of considerations.

g) Air Quality

- Geographic Impact Area and Causes - Which model will be used to identify areas that could potentially be affected by degraded air quality due to the Specific Plan's buildout? The Initial Study indicates that the impact will be limited to the immediate area, including the Specific Plan Area and nearby communities of Niland and Calipatria. However, air flow models should include those that measure pollutant transport to other areas of Imperial County, air basins, and air districts. In addition, we must also consider the broader impact on air quality caused by the buildout of the Specific Plan Area on the already receding Salton Sea.

- Types of Bad Air - The Initial Study does not include the full list of air quality measurements and does not address monitoring protocols, so these should be explained fully in the draft EIR. The PEIR must also include exposure to

asbestos, lead, bird waste, and other respiratory irritants, with specific attention made in CalEnviro Screen designated areas.

- Fenceline Communities - Again, in this part of the Initial Study it is not clear if Brawley or other incorporated cities in proximity to the proposed development are included in the analysis. It is listed as "nearby" but not "adjacent" to the SPA like Niland and Calipatria. Are there also potentially new/future residential areas that will be exposed to increased air pollution from changes to the Specific Plan?

- Other Possible Mitigation Measures - In addition to dust suppression and mitigation, plans should be outlined for pavement of roads, ideally with permeable material to mitigate climate and health risks. The role of electric vehicles (EVs), including trucks and off-road vehicles, in mitigating air pollution from traffic and goods transportation should be outlined in detail with performance metrics for commute trip reduction, rideshare programs, and heavy-duty charging infrastructure. Appropriate setbacks for schools, residential areas, and community opportunity areas should be included in alternatives for industrial developments, manufacturing, warehouses and associated diesel truck traffic and idling.

- Best Available Control Technologies (BACT) for Novel Operations - The PEIR needs to address the novelty of DLE industry–especially at the scales that are being proposed–and acknowledge that emerging issues, impacts, and best practices are evolving as this industry develops. The PEIR can mitigate this by first implementing BACT and other mitigation measures or project design features currently known, this should include consideration of BACTs employed elsewhere through the State (e.g., CABR's BACT Clearinghouse).[xv] Second, the PEIR needs to ensure a process for periodic review of BACTs and other emerging best practices that can be employed in future projects, as well as previously approved projects, under the Specific Plan that may tier off the PEIR. This could be achieved through an annual review process, subject to a public review and the ability of the public and other public agencies to weigh in on emerging impacts, BACTs, and other issues that may emerge as the industry near the Salton Sea develops.

h) Desert Renewable Energy Conservation Plan (DRECP)

The PEIR must analyze whether the Specific Plan complies with the management goals of the Desert Renewable Energy Conservation Plan (DRECP). The entire Specific Plan area is inside the DRECP Planning Area, which is important to note for the identification of cumulative impacts across the region and consistent mitigations. The initial intent of DRECP rules and regulations were to also be applicable to private lands, so called "Phase II" of the DRECP, although up until now it has focused on public lands administered by the Bureau of Land Management (Phase I). According to the DRECP's cumulative impact analysis, "Phase II renewable energy projects would be dictated in part by County renewable energy plans." How will Imperial County coordinate with DRECP programs and rules to be consistent with those landscape level planning efforts? How might the DRECP provide guidance on renewables development and impact mitigations regarding habitat conservation for biological resources? This analysis is relevant to be consistent with applicable land use plans and or energy impacts.

i) Biological Resources

The EIR must disclose permitting requirements for de-watering already completed and planned and analyze impacts on wetland ecosystems and special status species. Please analyze impacts to aquatic bird species from the charging source of water used for habitat, and monitor water quality in the project area, as well as on mitigation sites. Please consider alternatives for deterrents to the use of brine ponds by avian species as part of the development and administration of a wildlife protection plan for special status species as a condition of approval. Operators should adhere to best practices to avoid power line avian electrocutions and collisions; include technical details and drawings for perch deterrents and other design features built into the project equipment and buildings. Cumulative impacts including related projects need to be examined at an appropriate scale.

j) Energy

The Initial Study finds that there is "No Impact" for item VI.b "Conflict with or obstruct a state or local plan for renewable energy or energy efficiency." However, this may depend on the assumptions behind threshold VI.a regarding inefficient consumption of energy resources. It will be critical for the EIR to disclose the proportion of geothermal energy contributing firm or baseload power to the grid vis-a-vis energy (which may include fossil fuels in addition to renewables) used on-site for purposes like lithium extraction. Generating renewable electricity for the grid should not be conflated with the extraction of lithium for potential energy storage through battery manufacturing. The latter should be treated as a mineral resource rather than renewable energy, even if it may be a key ingredient to common battery chemistries. The PEIR needs to consider how each project may incorporate renewable energy on-site. To the extent it fails to do so, this can be considered an impact under CEQA Guidelines Appendix F.

k) Public Services

- Fire Fighting Resources: Development of the Specific Plan will stretch firefighting resources for wildland fires. Mitigation measures need to be included for this, especially given a) the history of devastating fires in Niland and the surrounding area and b) the combustibility and flammability of lithium-ion battery materials.

- Access to Healthcare: There is a serious need for hospitals and health centers, as well as other public facilities in the neighboring communities, such as cooling centers. The PEIR must analyze the impact to existing healthcare delivery, as well as consider alternatives that include infrastructure planning for such public services so that the currently modest healthcare services are not overwhelmed. For example, healthcare services could be included in the community opportunity areas.

l) Hydrology and Water Quality

- Hydrogeology Study Needed – A detailed hydrogeology study should be provided with the PEIR in order to understand the potential impacts of brine and waste spills on groundwater. Even though water quality is already impaired due to pesticides and other agricultural chemicals, alternatives should support conservation or restoration rather than perpetuating a sacrifice zone through further degradation due to waste discharge and reduced recharge. Alternatives should analyze the impact of flooding on potential contamination from drilling sumps or brine ponds, as well as cumulative impacts on water quality from disposal of geothermal fluids and upward mobility of fluids due to faulty injection well seals or seeps from brine ponds.

- Groundwater Quality Mitigation Needed – The Initial Study states on p. 34 that industrial uses of groundwater might be possible because of lower water quality requirements, and that Imperial County is a low priority for the Sustainable Groundwater Management Act (SGMA). Nonetheless, the use of groundwater and recharge of geothermal water may exacerbate the risks of subsidence and pose other threats to groundwater. The PEIR should consider re-evaluation of the low priority designation that would make the area exempt from the SGMA given the considerable impacts on groundwater.

m) Land Use and Planning

- Urban Designations within Sphere of Influence: The Initial Study analysis framework is not clear in its alignment with Imperial County's Land Use Element and the designation of urban areas for land adjacent to certain incorporated and unincorporated areas. A clear framework must be explained in the PEIR. This designation is important as it aligns with compatible land uses, the level of service, infrastructure capacity, environmental impacts of this level of service, and financing needs and structures. The Land Use Element States, which states on page 60:

"*The Urban Area designation on the Land Use Plan includes areas surrounding the seven incorporated cities: Brawley, El Centro, Westmorland, Holtville, Calipatria, Imperial and Calexico. Urban Areas also include the unincorporated communities of Niland, Heber, Seeley, Winterhaven and West Shores/Salton City (see also Figure 1). These areas are characterized by a full level of urban services, in particular public water and sewer systems, and contain or propose a broad range of residential, commercial, and industrial uses.*

It is anticipated that these areas will eventually be annexed or incorporated and should be provided with the full range of public infrastructure normally associated with cities. Therefore, development in these areas, while allowed in the County, any new development shall provide for the extension or development of full urban services such as public sewer and water, drainage improvements, street lights, fire hydrants, and fully improved paved streets with curbs and, in many cases, sidewalks. If located within an urban area, such improvements shall be consistent with City standards as determined by the director.

In cases where the Urban area is located in the unincorporated communities (i.e. Heber, Seeley, etc.) improvements shall be consistent with County standards as determined by the Director of Planning & Development Services. Development proposed outside of a designated Urban area shall either require an amendment to an existing Urban area or be designated as a new Specific Plan Area meeting full Urban area improvement standards."

"*Calipatria Urban Area – This (approximately) 4,285 acre area surrounds the incorporated City of Calipatria and is generally bounded on the west by Lyerly Road, Bowles Road, Coberly Road, and English Road, on the north by Young Road with an northerly extension to Wilkenson between*
Coberly and Carrick Roads, on the east by Blair Road and Carrick Road, and on the south by Yocum Road and Bowles Road."

"*Niland Urban Area – This (approximately) 1,290 acre area surrounds the unincorporated community of Niland and is bounded on the west by Nieto Road, on the north by the railroad tracks, and the north line of which is approximately 1,000 feet north of Beal Road, on the east by the extensions of Cuff Road and Memphis Avenue, and on the south by the Noffsinger and Alcott Roads*."

While the Initial Study describes the surrounding land uses and settings as areas dedicated to residential communities in Calipatria, Niland, and Brawley, other areas of the Initial Study do not similarly acknowledge and reflect these urban designations and their related infrastructure and public facility requirements. [IS page 8] For example:

Urban Area (page 57 of the Land Use Element): "All proposed subdivision development and new multiple family, commercial, and industrial development within the Urban Area category, shall be required to provide full public street and drainage improvements, including the installation of curb and gutter, sidewalks, sewers and potable water. Such improvements shall comply with that City's design and improvement standards."

n) Dilution of Mineral Resources due to Reinjection and Waste Streams

The EIR must analyze the potential for reinjection of lithium-depleted brine to dilute the mineral resource, significantly undermining the sustainability of lithium extraction in the Specific Plan Area.[xvi] The reinjection process requires precise monitoring to avoid significant dilution of resources. Moreover, alternatives should study the feasibility and offer life cycle assessments for sustainable production of other mineral resources besides lithium that might risk being disposed as solid waste if not reinjected, including zinc, manganese, silica and other minerals.

o) Population and Housing

- Mitigate "Man-Camps" – Alternatives should be provided to maximize affordable housing and local source hiring and to minimize adverse social and environmental impacts resulting from recruitment of a temporary labor force in makeshift boarding houses and "man-camps." Boom and bust effects associated with extractive resource developments may ironically limit long-term infrastructure development and instead perpetuate conditions of underdevelopment.

- Include Residential Units in Alternatives – Land uses within the sphere of influence of an adjunct incorporated city should include workforce housing, as well as address shortfalls in housing affordable to lower-income households, including the number of units requiring substantial rehabilitation. The current Specific Plan selected alternative removes residential units and does not specifically specify funding and when and where they will be replaced.

- Labor Recruitment Planning – Several scenarios should be run to better understand the need for certain skilled workers for known businesses in the specific area and their labor needs. To the extent, those workers are not available at the time the jobs are open, workers from out of Imperial County will be recruited and potentially increasing housing costs across the county, pushing out current residents who will need to seek other housing, and increasing VMTs for commuting workers and air quality and GHG impacts on the project.

p) Transportation

The Specific Plan will have significant impacts on transportation. The EIR should consider mitigation measures and alternatives to meet environmental justice goals related to transportation. This should include:

- Bike paths, shade cover, parking when accessing paths, water, and air for tires
- 100 percent EV truck fleet for all off-shipment
- Docks 100% plug-in
- Trip logs with real-time monitoring
- Describe specific plans for commute trip reduction and/or rideshare program
- Consult with Imperial Valley Transit to support existing or develop new public transit routes to project sites from nearby towns. Provide employees that are willing/able to utilize public transit with free bus passes.
- Monitor VMT and traffic impacts; report changes to traffic from project

q) Infrastructure Development Constraints

Future development within the Specific Plan is limited by the capacity of the existing infrastructure and the ability to provide new public facilities. The PEIR must consider how economic growth and the buildout of the Specific Plan Area could be impacted by the current lack of infrastructure and service delivery capacity, including financing constraints due to local market conditions and historic disinvestment. The analysis should include comparative timelines of how long it will take to gain financing and upgrade required infrastructure relative to the opening and operation of lithium extraction, processing, and manufacturing facilities. In addition, the analysis should identify and evaluate the impact of existing easements, and property encumbrances on proposed land uses. This infrastructure development is part-and-parcel to the Plan, which will induce further capacity and development of this industry.

3. General Comments

a) Insufficient Time Relative to New Specific Plan Information Published

Existing law, Government Code Section 65451, requires a specific plan to include projected land uses, identification of major infrastructure components, and implementation and financing programs. The publication of the 668-page "Final Baseline Report" on February 15, 2024, without any apparent notification to the public, diminishes what should be a transparent process and severely restricts the public's opportunity to review the IS in light of the extensive baseline data, assessment, and analysis provided in the Final Baseline Report. This is particularly a problem concerning input on infrastructure and related financing programs because the Initial Baseline Report did not have a completed Infrastructure Assessment.

While the Initial Study indicates a wide range of environmental factors potentially affected by the Specific Plan, meaningful input and feedback by the public regarding the Initial Study's explanation of each issue, including the significance criteria or threshold used to evaluate each question related to the environmental factors and potential mitigation measures, is impeded by the late publication of the Final Baseline Report.

This potentially impacts all forward actions on the Specific Plan by the County of Imperial because, according to the Initial Study on page 3, the "*assessment of public input received during the NOP public review regarding the scoping of issues and alternatives will be considered and evaluated within the Environmental Impact Report (EIR)...*[the] *IS and Notice of Preparation (NOP) are informational documents which are intended to inform County of Imperial decision makers, other responsible or interested agencies, and the general public of potential environmental effects of the proposed Specific Plan implementation*."

Please re-notice a public comment period whenever new information is released to comply with CEQA and ensure transparent public engagement.

b) Initial Study Framework's Ability to Inform the Review and Evaluation of the Specific Plan

Existing law, Government Code Section 65451, requires a specific plan to provide information in sufficient detail (text and diagrams) to inform the public regarding:

(1) The distribution, location, and extent of the uses of land within the area covered by the plan.

(2) The proposed distribution, location, and extent and intensity of major components of public and private transportation, sewage, water, drainage, solid waste disposal, energy, and other essential facilities proposed to be located within the area covered by the plan and needed to support the land uses described in the plan.

(3) Standards and criteria by which development will proceed, and standards for the conservation, development, and utilization of natural resources, where applicable.

(4) A program of implementation measures, including regulations, programs, public works projects, and financing measures necessary to carry out (1), (2), and (3).

The Initial Study does not consistently provide the evaluation framework in each identified category, especially as the document identifies significance criteria or threshold used to evaluate each question and the mitigation measures identified to reduce the impact to less than significance.

The Specific Plan is also required to discuss how the plan implements the policies of the general plan, including a detailed statement of the relationship of the Specific Plan to the individual general plan elements, including consistency between both plans and a comparison of goals, objectives, and policies. The Initial Study should clearly state how the planning agency intends to address this requirement in sufficient detail as necessary to

ensure the public can review the approach, evaluate potential limitations, and propose alternative methods for eliminating or reducing any potentially adverse impacts.

The Initial Study is inconsistent in explaining the relevant General Plan and elements. For example, the Conservation and Open Space Element is discussed in the explanation on the potential of the Specific Plan to impact Aesthetics and Geology and Soils, but there no such information is included under Biological Resources, even though a determination has been made that the Specific Plan may significantly conflict with local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?

In addition, the Specific Plan is required to address how it aligns with the policies of the general plan. This includes specific information on the relationship of the Specific Plan to the individual general plan elements, including consistency between both plans and a comparison of goals, objectives, and policies. The planning agency should explain this in detail to enable public review and evaluation of potential environmental consequences. The agency must also propose measures to eliminate or reduce any adverse impacts. However, the explanation provided in the Initial Study regarding the relevant General Plan and its elements is inconsistent. In a majority of environmental impact categories, the Lead Agency indicates there could be a potentially significant impact. However, these issues are not followed up in the explanation.

Specific plans are also required under §65451(a)(2) to identify proposed major components of infrastructure needed to support planned land uses. While the "goal of the Project is to frame and guide the development of renewable energy sources, such as geothermal and solar energy, as well as lithium extraction and associated industrial uses and infrastructure improvements," the identification of major components of infrastructure is inconsistent. This lack of specificity inhibits the public ability to review, evaluate, and consider alternatives to infrastructure, including financing.

c) The Value Proposition

The Legislature approved, and the Governor signed the 2022-23 budget, which provided Imperial County with $5 million for a county programmatic environmental impact report (PEIR), a health impact assessment, and community outreach related to lithium development. This funding was intended to support the implementation of recommendations in the final report of the Blue Ribbon Commission on Lithium Extraction in California. The Governor explains these state investments as "*building out a world-class battery manufacturing ecosystem in tandem with lithium production and processing would also increase economic opportunity in the Salton Sea region, delivering quality jobs and community benefits*."

The use of non-developer and non-county funds to prepare and adopt the Lithium Valley Specific Plan, including PEIR, allows the County to fully embrace the lithium value proposition, which includes sharing the community and economic benefits of the emerging lithium industry sectors with the Imperial Valley community members while advancing California's clean energy market.

Without the pressures of developers to limit the scope of the project and the flexibility of state funding, the County can fully engage the public in defining its vision of future growth and development of these 51,786 acres. These opportunities go well beyond land uses for mineral extraction and energy generation. The Specific Plan adoption process should include an analysis of the impact of community benefits, alternatives that support best practices of planning in spheres of influence, and innovative alternatives and mitigation measures. Development of the Specific Plan Area should consider integrated planning for transportation, intermodal goods movement, workforce housing, new and enhanced public facilities, and research facilities and civic infrastructure to ensure innovation and clean technology remain at the center of Lithium Valley development.

The need for this broader look at land uses and their related potential environmental impacts is also underscored in state statute. When preparing a specific plan, Government Code Section 65452 authorizes local governments

to "*address any other subjects which in the judgment of the planning agency are necessary or desirable for implementation of the general plan*."

The content of the Specific Plan and the analysis in the PEIR needs to embrace this unique planning opportunity. Limiting the scope of the analysis and not considering how the Specific Plan can advance General Plan policies related to community benefits also limits the value proposition. According to the Governor's Office of Planning and Researcher's Planner's Guide to Specific Plans:

"*A thorough specific plan can enable planners to effectively implement selected long term general plan objectives in a short time frame. The enabling statutes are flexible, allowing public agencies to create standards for the development of a wide range of projects or solutions to any type of land use issues. The plan may present the land use and design regulations which guide the development of a city center, … or incorporate land use and zoning regulations, infrastructure plans, and development approval processes for the development of residential, office, commercial and open space uses*."

A more robust PEIR analysis for the Lithium Valley would create a stronger foundation from which future business and community development proposals could be processed by removing the need for additional environmental documentation.

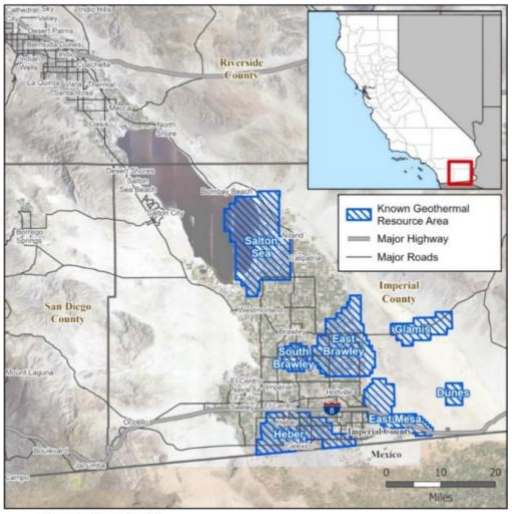
Environmental justice does not appear anywhere in the Initial Study (except in the titles of publications in the bibliography). Given the role of federal resources/investments that might drive development in the area (tax incentives, loans, etc.), the Initial Study should include environmental justice because some federal investments could have a nexus and require an EJ analysis in accordance with NEPA. This section should not only address existing environmental impacts suffered by the community, but also assess the historic hurdles faced by these communities in the political process, as well as the inequitable distribution of economic benefits of prior/current decisions made by the County. Without this proper context, the Specific Plan foregoes opportunities to avoid past mistakes.

In addition to lost opportunities, a specific plan prepared for too narrow of a purpose, or only reflecting in detail, a handful of anticipated extraction facilities may quickly become obsolete if markets shift and/or require extensive revisions to support future development effectively.

d) Connection to Nearby Known Geothermal Resource Areas

Among other sources, the final report of the Blue Ribbon Commission on Lithium Extraction in California identified more than half a dozen areas in Imperial County as Known Geothermal Resource Areas, including the proposed Specific Plan Area. Below is Figure ES-1: Map of the Salton Sea and Surrounding Regional with Nearby Known Geothermal Resource Areas.

Figure ES-1: Map of the Salton Sea and Surrounding Region with Nearby Known Geothermal Resource Areas



Source: CEC Staff

To analyze the potential impacts of the Specific Plan, the PEIR must also examine how the proposed land uses, policies, and activities within the Specific Plan area relate to all of these known geothermal resource areas. This includes the direct, induced, and particularly cumulative impacts on air quality, public services, and public facilities, among other environmental impacts.

The scale of the study area seems to shift throughout the planning documents for Lithium Valley. In the Initial Study, local cities of Calipatria, Niland and Brawley are included in some of the descriptions of the Project Planning Area (Dudek, 2023, p. 2; p. 8), but not the Specific Plan Area (p. 5). Other references to the Project Area also exclude incorporated cities (Dudek, 2023, p. 14). This needs to be clarified in relation to the broader developments underway for geothermal energy. New geothermal development projects proposed by Ormat outside the Study Area at Salton City (not included in the Known Geothermal Resource Area) and Heber have already entered the permitting process.[xvii] Presumably, such new development projects will draw from the same apportionment of Colorado River water for non-agricultural uses, and these cumulative impacts need to be considered in the PEIR.

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[xiii] Gates, T., & Crawford, C. (2010). *Ethnographic Assessment of the Importance of Obsidian Butte to the Native American Community, Imperial County, California*. California Energy Commission.

[xiv] See: Roth, S. (2023, January 17). Want to solve climate change? This California farm kingdom holds a key. *Los Angeles Times*. https://www.latimes.com/environment/story/2023-01-17/want-to-solve-climate-change-this-california-farm-kingdom-holds-the-key

[xv] https://ww2.arb.ca.gov/our-work/programs/technology-clearinghouse.

[xvi] See: Horne, R. N. (1982). Geothermal Reinjection Experience in Japan. *Journal of Petroleum Technology,* 34(03), 495–503. https://doi.org/10.2118/9925-PA

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[xvii] Imperial County. 2024. Notice of Completion: Ormat-Truckhaven Geothermal Zone Change and General Plan Amendment Project ZC #22-0004 & GPA #22-003, https://www.icpds.com/assets/GPA22-0003-Orni-5-LLC-NOC-2.13.24.pdf

Imperial County. 2024. NOTICE OF PREPARATION OF DRAFT EIR FOR DOGWOOD GEOTHERMAL ENERGY PROJECT, HEBER 2 PARASITIC SOLAR PROJECT, AND HEBER FIELD COMPANY GEOTHERMAL WELLS AND PIPELINE PROJECT AND NOTICE OF PUBLIC EIR SCOPING MEETING, https://www.icpds.com/assets/CUP23-0020-NOP-IV-Press-Ad.pdf

Earthjustice

Batch 2 of Attachments to Scoping Comments on Proposed Lithium Valley Specific Plan and Program Environmental Impact Report

Feb. 20, 2024

STATE OF CALIFORNIA
ENVIRONMENTAL PROTECTION AGENCY
DEPARTMENT OF TOXIC SUBSTANCES CONTROL

IN THE MATTER OF:	Docket SRPD GIC851471
CalEnergy Operating Corporation, CE Generation, LLC, Magma Power Company, Leathers, L.P., Del Ranch, L.P., Elmore, L.P., Vulcan/BN Geothermal Power Company, Vulcan Power Company, Salton Sea Power Generation, L.P., and Salton Sea Power, LLC,	CORRECTIVE ACTION CONSENT AGREEMENT
Respondents.	Health and Safety Code section 25187

INTRODUCTION

1.1. The Department of Toxic Substances Control ("DTSC") and CalEnergy Operating Corporation, CE Generation, LLC, Magma Power Company, Leathers, L.P., Del Ranch, L.P., Elmore, L.P., Vulcan/BN Geothermal Power Company, Vulcan Power Company, Salton Sea Power Generation, L.P., and Salton Sea Power, LLC (collectively referred to herein as "CalEnergy Defendants"), enter into this Corrective Action Consent Agreement ("Consent Agreement") and agree as follows:

1.2 DTSC has jurisdiction over the regulation and control of hazardous waste, and is authorized, pursuant to Health and Safety Code section 25187, to issue an order requiring corrective action when DTSC determines that there is or may be a release of hazardous waste or hazardous waste constituents into the environment.

1.3. The parties enter into this Consent Agreement pursuant to the terms of the Final Judgment and Injunction Pursuant to Stipulation in the case entitled People of the State of California v. CalEnergy Operating Corporation, et al., Case No. GIC851471, San Diego Superior Court ("the Action"), and to carry out promptly the corrective action described below.

1.4. Respondents are the owners and operators of the following geothermal energy production facilities ("Facilities") that generate hazardous waste:

(a) Salton Sea Geothermal Power Plant Units 1 & 2, located in Region 1 at 6920 Lack Road, Calipatria, California 92233 ("Salton Sea Facility Units 1 & 2");

(b) Salton Sea Geothermal Power Plant Units 3, 4 & 5, located in Region 1 at 6922 Crummer Road, Calipatria, California 92233 ("Salton Sea Facility Units 3, 4 & 5");

(c) Vulcan Geothermal Power Plant, located in Region 2 at 7001 Gentry Road, Calipatria, California 92233 ("Vulcan Facility");

(d) Del Ranch Geothermal Power Plant, a.k.a. A. W. Hoch, located in Region 2 at 7029 Gentry Road, Calipatria, California 92233 ("Del Ranch Facility");

(e) J.J. Elmore Power Plant, a.k.a. Elmore Power Plant, located in Region 3 at 786 West Sinclair Road, Calipatria, California 92233 ("Elmore Facility");

(f) Leathers Geothermal Power Plant, located in Region 3 at 342 West Sinclair Road, Calipatria, California 92233 ("Leathers Facility"); and

(g) Central Services, located at 480 West Sinclair Road, Calipatria, California 92233 ("Central Services Facility")

Each of the Facilities is located in Imperial County with administrative offices at 7030 Gentry Road, Calipatria, California 92233

1.5. The terms used in this Consent Agreement are as defined in California Code of Regulations, title 22, section 66260.10, except as otherwise provided.

1.6 Respondents agree to implement all DTSC-approved workplans and to undertake all actions required by the terms and conditions of this Consent Agreement, including any portions of this Consent Agreement incorporated by reference

1.7. Respondents waive any right to request a hearing on this Consent Agreement pursuant to Health and Safety Code section 25187.

FINDINGS OF FACT

2.1. Between July 31, 2000 and June 25, 2001, DTSC conducted several site inspections of the Facilities Based on the site inspections and the information available to DTSC, DTSC has identified areas of concerns (AOCs) where hazardous waste or hazardous waste constituents may have been released into the environment.

2.2. Based on the information available to DTSC, DTSC concludes that further investigation is needed to determine the nature and extent of any release of hazardous waste or hazardous waste constituents in the following AOCs:

(a) Near and around surface impoundments, including the tops of berms and areas down wind from the impoundments;

(b) Filter cake bay storage areas;

(c) Hydro blast pads;

(d) Areas adjacent to the hydro blast pad and adjacent to pipes containing hazardous waste scale at the equipment yard located at the Leathers Facility (as alleged in the Fourteenth Cause of Action in the Complaint filed in the Action);

(e) Areas near the zinc recovery storage area and within the filter cake bays located at the Elmore Facility (as alleged in the Twentieth Cause of Action in the Complaint filed in the Action);

(f) The area immediately adjacent to the south side of the hydro blast pad located at the Salton Sea Facility Units 3, 4 & 5 (as alleged in the Twenty-Sixth Cause of Action in the Complaint filed in the Action);

(g) The area adjacent to the north yard concrete slab at the Salton Sea Facility Units 1 & 2 (as alleged in the Thirty-First Cause of Action in the Complaint filed in the Action); and

(h) The areas near and around the hydro blast pad located at the Central Services Facility (as alleged in the Thirty-Fourth Cause of Action in the Complaint filed in the Action).

2.3. The hazardous waste and hazardous waste constituents of concern at the Facilities include arsenic and lead.

PROJECT COORDINATOR

3. Within fourteen (14) days of the effective date of this Consent Agreement, DTSC and Respondents shall each designate a Project Coordinator and shall notify each other in writing of the Project Coordinator selected. Each Project Coordinator shall be responsible for overseeing the implementation of this Consent Agreement and for designating a person to act in his/her absence. All communications between Respondents and DTSC, and all documents, report approvals, and other correspondence concerning the activities performed pursuant to this Consent Agreement shall be directed through the Project Coordinators. Each party may change its Project Coordinator with at least seven (7) days prior written notice.

WORK TO BE PERFORMED

4. Respondents agree to perform the work required by this Consent Agreement in accordance with the applicable state and federal laws, their implementing regulations, and the applicable DTSC and United States Environmental Protection Agency (USEPA) guidance documents.

PRELIMINARY ENDANGERMENT ASSESSMENT

5. Respondents shall conduct five (5) Preliminary Endangerment Assessments ("PEA") for the Facilities as follows:

1. A PEA will be prepared for the AOCs identified in Paragraph 2.2 in Region 1;

2. A PEA will be prepared for the AOCs identified in Paragraph 2.2 in Region 2;

3. A PEA will be prepared for the AOCs identified in Paragraph 2.2 at the Elmore Facility;

4. A PEA will be prepared for the AOCs identified in Paragraph 2.2 at the Leathers Facility; and

5. A PEA will be prepared for the AOCs identified in Paragraph 2.2 at the Central Services Facility.

If necessary, Respondents shall conduct further investigation and remediation of any release of hazardous waste or hazardous waste constituents at or from the Facilities. Within 30 days of the effective date of this Consent Agreement, Respondents shall submit to DTSC a PEA Workplan for one PEA, selected by Respondents, and an implementation schedule for approval. Within 60 days of receiving DTSC's written approval of the first PEA Workplan, Respondents shall submit to DTSC PEA Workplans for each of the other four PEAs and an implementation schedule for approval. Respondents shall implement each DTSC-approved PEA Workplan and schedule. Within 60 days after completion of the PEA activities, Respondents shall submit to DTSC a Final PEA Report for approval for each PEA. Respondents shall conduct each PEA in accordance with the Preliminary Endangerment Assessment Guidance Manual (State of California Environmental Protection Agency, Department of Toxic Substances Control, June 1999)

ADDITIONAL WORK

6. If DTSC determines that further investigation and remediation are necessary at the Facilities, DTSC and Respondents will amend this Consent Agreement to address the additional work. If an amendment is not reached within 60 days, DTSC reserves its right to issue an order or take any other action provided for by law. DTSC's costs incurred in negotiating the amendment, if any, are considered costs incurred pursuant to this Consent Agreement and are payable under this Consent Agreement.

CALIFORNIA ENVIRONMENTAL QUALITY ACT

7. DTSC must comply with the California Environmental Quality Act (CEQA) insofar as activities required by this Consent Agreement are projects subject to CEQA. Respondents shall provide all information necessary to facilitate any CEQA analysis. DTSC will make an initial determination regarding the applicability of CEQA. If the activities are not exempt from CEQA, DTSC will conduct an Initial Study. Based on the results of the Initial Study, DTSC will determine if a Negative Declaration or an Environmental Impact Report (EIR) should be prepared. DTSC will prepare and process any such Negative Declaration. However, should DTSC determine that an EIR is necessary, such an EIR would be prepared under a separate agreement between DTSC and Respondents.

DTSC APPROVAL

8.1. Respondents shall revise any workplan, report, specification, or schedule to address DTSC's written comments. Respondents shall submit to DTSC any revised documents by a reasonable due date specified by DTSC. Revised submittals are subject to DTSC's approval or disapproval

8.2. Upon receipt of DTSC's written approval, Respondents shall commence work and implement any approved workplan in accordance with the schedule and provisions contained therein

8.3. Any DTSC-approved workplan, report, specification, or schedule required under this Consent Agreement shall be deemed incorporated into this Consent Agreement.

8.4 Verbal advice, suggestions, or comments given by DTSC representatives will not constitute an official approval or decision.

SUBMITTALS

9.1 Beginning with the first full month following the effective date of this Consent Agreement, Respondents shall provide DTSC with quarterly progress reports of corrective action activities conducted pursuant to this Consent Agreement. Progress reports are due on the last day of the first month following the close of each reporting period. The progress reports shall conform to the Scope of Work for Progress Reports contained in Attachment A. DTSC may adjust the frequency of progress reporting to be consistent with site-specific activities

9.2. Any report or other document submitted by Respondents pursuant to this Consent Agreement shall be signed and certified by the Project Coordinator, a responsible corporate officer, or a duly authorized representative.

9.3. The certification required by paragraph 9.2 above, shall be in the following form:

> I certify that the information contained in or accompanying this submittal is true, accurate, and complete. As to those portions of this submittal for which I cannot personally verify the accuracy, I certify that this submittal and all attachments were prepared at my direction in accordance with procedures designed to assure that qualified personnel properly gathered and evaluated the information submitted.
>
> Signature: _____
>
> Name: _____
>
> Title: _____
>
> Date: _____

9.4. Respondents shall provide three (3) copies of all documents, including but not limited to, workplans, reports, and correspondence. Submittals specifically exempted from this copy requirement are all progress reports and correspondence of less than fifteen (15) pages, of which one copy is required.

9.5. Unless otherwise specified, all reports, correspondence, approvals, disapprovals, notices, or other submissions relating to this Consent Agreement shall be in writing and shall be sent to the current Project Coordinators.

PROPOSED CONTRACTOR/CONSULTANT

10 All work performed pursuant to this Consent Agreement shall be under the direction and supervision of a professional engineer or registered geologist, registered in California, with expertise in hazardous waste site cleanup. Respondents' contractor or consultant shall have the technical expertise sufficient to fulfill his or her responsibilities. Within fourteen (14) days of the effective date of this Consent Agreement, Respondents shall notify the DTSC Project Coordinator in writing of the name, title, and qualifications of the professional engineer or registered geologist and of any contractors or consultants and their personnel to be used in carrying out the terms of this Consent Agreement.

QUALITY ASSURANCE

11.1 All sampling and analyses performed by Respondents under this Consent Agreement shall follow applicable DTSC and USEPA guidance for sampling and analysis. Workplans shall contain quality assurance/quality control and chain of custody procedures for all sampling, monitoring, and analytical activities. Any deviations from the approved workplans must be approved by DTSC prior to implementation, must be documented, including reasons for the deviations, and must be reported in the applicable report.

11.2. The names, addresses, and telephone numbers of the California State certified analytical laboratories Respondents propose to use must be specified in the applicable workplans.

SAMPLING AND DATA/DOCUMENT AVAILABILITY

12.1. Respondents shall submit to DTSC upon request the results of all sampling and/or tests or other data generated by its employees, agents, consultants, or contractors pursuant to this Consent Agreement.

12.2 Respondents shall notify DTSC in writing at least seven (7) days prior to beginning each separate phase of field work approved under any workplan required by this Consent Agreement. If Respondents believe they must commence emergency field activities without delay, Respondents may seek emergency telephone authorization from DTSC's Project Coordinator or, if the Project Coordinator is unavailable, his/her Branch Chief, to commence such activities immediately.

12.3. At the request of DTSC, Respondents shall provide or allow DTSC or its authorized representative to take split or duplicate samples of all samples collected by Respondents pursuant to this Consent Agreement. Similarly, at the request of Respondents, DTSC shall allow Respondents or their authorized representative to take split or duplicate samples of all samples collected by DTSC under this Consent Agreement.

ACCESS

13. Subject to the Facilities' security and safety procedures, Respondents agree to provide DTSC and its representatives access at all reasonable times to the Facilities and any off-site property to which access is required for implementation of this Consent Agreement and shall

permit such persons to inspect and copy all records, files, photographs, documents, including all sampling and monitoring data, that pertain to work undertaken pursuant to this Consent Agreement and that are within the possession or under the control of Respondents or their contractors or consultants.

RECORD PRESERVATION

14.1 Respondents shall retain, during the pendency of this Consent Agreement and for a minimum of three (3) years after its termination, all data, records, and documents that relate in any way to the performance of this Consent Agreement or to hazardous waste management and/or disposal at the Facilities.

14.2. If Respondents retain or employ any agent, consultant, or contractor for the purpose of carrying out the terms of this Consent Agreement, Respondents will require any such agents, consultants, or contractors to provide Respondents a copy of all documents produced pursuant to this Consent Agreement.

14.3. All documents pertaining to this Consent Agreement shall be stored in a central location at the Facilities, or at a location otherwise agreed to by the parties, to afford easy access by DTSC and its representatives.

DISPUTE RESOLUTION

15.1. The parties agree to use their best efforts to resolve all disputes informally. The parties agree that the procedures contained in this section are the sole administrative procedures for resolving disputes arising under this Consent Agreement. If Respondents fail to follow the procedures contained in this section, they shall have waived their right to further consideration of the disputed issue.

15.2. If Respondents disagree with any written decision by DTSC pursuant to this Consent Agreement, Respondents' Project Coordinator shall orally notify DTSC's Project Coordinator of the dispute. The Project Coordinators shall attempt to resolve the dispute informally.

15.3 If the Project Coordinators cannot resolve the dispute informally, Respondents may pursue the matter formally by placing their objection in writing. Respondents' written objection must be forwarded to Mr. Stephen W. Lavinger, Chief, Tiered Permitting Corrective Action Branch, Hazardous Waste Management Program, Department of Toxic Substances Control, with a copy to DTSC's Project Coordinator. The written objection must be mailed to the Branch Chief within fourteen (14) days of Respondents' receipt of DTSC's written decision. Respondents' written objection must set forth the specific points of the dispute and the basis for Respondents' position.

15.4. DTSC and Respondents shall have fourteen (14) days from DTSC's receipt of Respondents' written objection to resolve the dispute through formal discussions. This period may be extended by DTSC for good cause. During such period, Respondents may meet or confer with DTSC to discuss the dispute.

15.5. After the formal discussion period, DTSC will provide Respondents with its written decision on the dispute. DTSC's written decision will reflect any agreements reached during the formal discussion period and be signed by the Branch Chief or his/her designee.

15.6. During the pendency of all dispute resolution procedures set forth above, the time periods for completion of work required under this Consent Agreement that are affected by such dispute shall be extended for a period of time not to exceed the actual time taken to resolve the dispute. The existence of a dispute shall not excuse, toll, or suspend any other compliance obligation or deadline required pursuant to this Consent Agreement.

RESERVATION OF RIGHTS

16.1 DTSC reserves all of its statutory and regulatory powers, authorities, rights, and remedies, which may pertain to Respondents' failure to comply with any of the requirements of this Consent Agreement. Respondents reserve all of their statutory and regulatory rights, defenses and remedies, as they may arise under this Consent Agreement. This Consent Agreement shall not be construed as a covenant not to sue, release, waiver, or limitation on any powers, authorities, rights, or remedies, civil or criminal, that DTSC or Respondents may have under any laws, regulations or common law.

16.2 DTSC reserves the right to disapprove of work performed by Respondents pursuant to this Consent Agreement and to request that Respondents perform additional tasks.

16.3. DTSC reserves the right to perform any portion of the work consented to herein or any additional site characterization, feasibility study, and/or remedial actions it deems necessary to protect human health and/or the environment. DTSC may exercise its authority under any applicable state or federal law or regulation to undertake response actions at any time. DTSC reserves its right to seek reimbursement from Respondents for costs incurred by the State of California with respect to such actions. DTSC will notify Respondents in writing as soon as practicable regarding the decision to perform any work described in this section.

16.4. If DTSC determines that activities in compliance or noncompliance with this Consent Agreement have caused or may cause a release of hazardous waste and/or hazardous waste constituents, or a threat to human health and/or the environment, or that Respondents are not capable of undertaking any of the work required, DTSC may order Respondents to stop further implementation of this Consent Agreement for such period of time as DTSC determines may be needed to abate any such release or threat and/or to undertake any action which DTSC determines is necessary to abate such release or threat. The deadlines for any actions required of Respondents under this Consent Agreement affected by the order to stop work shall be extended to take into account DTSC's actions.

16.5 This Consent Agreement is not intended to be nor shall it be construed to be a permit. This Consent Agreement is not a substitute for, and does not preclude DTSC from requiring, any hazardous waste facility permit, post closure permit, closure plan or post closure plan. The parties acknowledge and agree that DTSC's approval of any workplan, plan, and/or specification does not constitute a warranty or representation that the workplans, plans, and/or specifications will achieve the required cleanup or performance standards. Compliance by

Respondents with the terms of this Consent Agreement shall not relieve Respondents of their obligations to comply with applicable provisions of the Health and Safety Code or any other applicable local, state, or federal law or regulation.

OTHER CLAIMS

17. Except as provided in this Consent Agreement, nothing in this Consent Agreement shall constitute or be construed as a release by DTSC or Respondents from any claim, cause of action, or demand in law or equity against any person, firm, partnership, or corporation for any liability it may have arising out of or relating in any way to the generation, storage, treatment, handling, transportation, release, or disposal of any hazardous constituents, hazardous substances, hazardous wastes, pollutants, or contaminants found at, taken to, or taken or migrating from the Facilities.

COMPLIANCE WITH WASTE DISCHARGE REQUIREMENTS

18. Respondents shall comply with all applicable waste discharge requirements issued by the State Water Resources Control Board or a California regional water quality control board.

OTHER APPLICABLE LAWS

19. All actions required by this Consent Agreement shall be conducted in accordance with the requirements of all local, state, and federal laws and regulations. Respondents shall obtain or cause its representatives to obtain all permits and approvals necessary under such laws and regulations.

REIMBURSEMENT OF DTSC'S COSTS

20.1. Respondents shall pay DTSC's costs incurred in the implementation of this Consent Agreement pursuant to the provisions of Chapter 6.66 of Division 20 of the Health and Safety Code. Such costs include DTSC's costs incurred in the preparation and implementation of this Consent Agreement prior to the effective date of this Consent Agreement.

20.2. An estimate of DTSC's costs is attached as Exhibit B showing the amount of $24,788 for each PEA or $123,940 total. It is understood by the parties that this amount is only a cost estimate for the activities shown on Exhibit B and it may differ from the actual costs incurred by DTSC in overseeing these activities or in implementing this Consent Agreement. DTSC will provide additional cost estimates to Respondents as the work progresses under the Consent Agreement.

20.3. Respondents shall make an advance payment to DTSC in the amount of $61,970 within 30 days of the effective date of this Consent Agreement. If the advance payment exceeds DTSC's costs, DTSC will refund the balance within 120 days after the execution of the Acknowledgment of Satisfaction pursuant to Section 22 of this Consent Agreement.

20.4. DTSC will provide Respondents with a billing statement at least quarterly, which will include the name(s) of the employee(s), identification of the activities, the amount of time spent on each activity, and the hourly rate(s) charged. If Respondents do not pay an invoice

within 60 days of receipt of the billing statement, the amount is subject to interest as provided by Health and Safety Code section 25360.1.

20.5. DTSC will retain all costs records associated with the work performed under this Consent Agreement as required by state law. DTSC will make all documents that support the DTSC's cost determination available for inspection upon request, as provided by the Public Records Act.

20.6. Any dispute concerning DTSC's costs incurred pursuant to this Consent Agreement is subject to the Dispute Resolution provision of this Consent Agreement and the dispute resolution procedures as established pursuant to Health and Safety Code section 25269.2 DTSC reserves its right to recover unpaid costs under applicable state and federal laws.

20.7. All payments shall be made within 30 days of receipt of the billing statement by check payable to the Department of Toxic Substances Control and shall be sent to:

Accounting Unit
Department of Toxic Substances Control
P O. Box 806
Sacramento, California 95812-0806

All checks shall reference the name of the Facilities, the Respondents' names and address, and the docket number of this Consent Agreement. Copies of all checks and letters transmitting such checks shall be sent simultaneously to DTSC's Project Coordinator.

MODIFICATION

21.1. This Consent Agreement may be modified by mutual agreement of the parties. Any agreed modification shall be in writing, shall be signed by both parties, shall have as its effective date the date on which it is signed by all the parties, and shall be deemed incorporated into this Consent Agreement.

21.2. Any requests for revision of an approved workplan requirement must be in writing. Such requests must be timely and provide justification for any proposed workplan revision. DTSC has no obligation to approve such requests, but if it does so, such approval will be in writing and signed by Mr. Stephen W. Lavinger, Chief, Tiered Permitting Corrective Action Branch, Hazardous Waste Management Program, Department of Toxic Substances Control, or his or her designee. Any approved workplan revision shall be incorporated by reference into this Consent Agreement.

TERMINATION AND SATISFACTION

22. The provisions of this Consent Agreement shall be deemed satisfied upon the execution by both parties of an Acknowledgment of Satisfaction ("Acknowledgment"). DTSC will prepare the Acknowledgment for Respondents' signature. The Acknowledgment will specify that Respondents have demonstrated to the satisfaction of DTSC that the terms of this Consent Agreement including payment of DTSC's costs have been satisfactorily completed. The

Acknowledgement will affirm Respondents' continuing obligation to preserve all records after the rest of the Consent Agreement is satisfactorily completed.

EFFECTIVE DATE

23. The effective date of this Consent Agreement shall be the date on which this Consent Agreement is signed by all the parties. Except as otherwise specified, "days" means calendar days.

SIGNATORIES

24. Each undersigned representative certifies that he or she is fully authorized to enter into this Consent Agreement.

DATE: March 5, 2007 BY: Original signed by Stephen Larsen
Stephen Larsen
President
CalEnergy Operating Corporation
Representing Respondents

DATE: Original March 7, 2007 BY: Original signed by Stephen Lavinger
Chief, Tiered Permitting Corrective Action Branch
Hazardous Waste Management Program
Department of Toxic Substances Control

ATTACHMENT A

SCOPE OF WORK FOR PROGRESS REPORTS

Progress reports shall, at a minimum, include:

1. All actions taken during the reporting period to achieve compliance with the Order;

2. A summary of any findings made during the reporting period;

3. All problems or potential problems encountered during the reporting period (also discuss problem solutions);

4. All projected work for the next reporting period as well as anticipated problems and avoidance measures;

5. A discussion of any changes in personnel that occurred during the reporting period;

6. Summaries of all contacts with representatives of the press local community or public interest groups; and

7. If requested by the Department, the results of any sampling, tests or other data generated during the Facility Investigation.

EXHIBIT B

COST ESTIMATE WORKSHEET
CORRECTIVE ACTION CONSENT AGREEMENT

Project Name: CalEnergy Corporation

PROGRAMS	Class Code	Class Name	PEA Investigation Workplan	PEA Investigation Oversight	PEA Investigation Report	Risk Assessment	Community Profile	Health & Safety Plan	Total Hours	Rate ($/hr)	Total Cost
HWMP	3564	HSS	18	18	16	12	4	12	80	$105	$8,400
	3566	SHSSI	4	4	4	2		2	16	$121	$1,936
	3567	SHSSI							0	$139	$0
	1181	WPT	2		2				4	$57	$228
Public Participation	5373	PPS					12		12	$98	$1,176
	5372	PPSupervisor							0	$117	$0
Legal Counsel	5778	Supervisor							0	$151	$0
Toxicologist	7978	Staff			16	16			32	$142	$4,544
	7943	Senior							0	$149	$0
OPAEA	4713	Senior							0	$129	$0
Hydro/Geologist	3756	HSEG	16	16	16				48	$123	$5,904
	3751	SHSEGI							0	$133	$0
	3729	SHSEG							0	$133	$0
Industrial Hygienist	3852	Senior		4				16	20	$130	$2,600
		Total	40	42	54	30	16	30	212	TOTAL =	$24,788

This estimate assumes only for PEA. Amendment to Consent Agreement may be needed if IM is required basded on PEA investigation.

* Note: This cost estimate does not include any other additional work that may be required but a cost estimate will be provided upon completion of PEA report.

+ PEA Investigation:Review/comment on workplan/report and field oversight

+ Community Profile: Review/comment of Community Profile data and report - Fact Sheet, Public Notice, Public meeting

+ Hourly Rates are DTSC Contract Estimation Rates effective 7/01/06 - 6/30/07. (Hourly Rate + Indirect @ 157.67%)

* The estimate is for each PEA investigation. A total of 5 PEA will be performed.

https://experience.arcgis.com/experience/1c21c53da8de48f1b946f3402fbae55c/page/SB-535-Disadvantaged-Communities/

SB 535 Disadvantaged Communities (2022 Update)

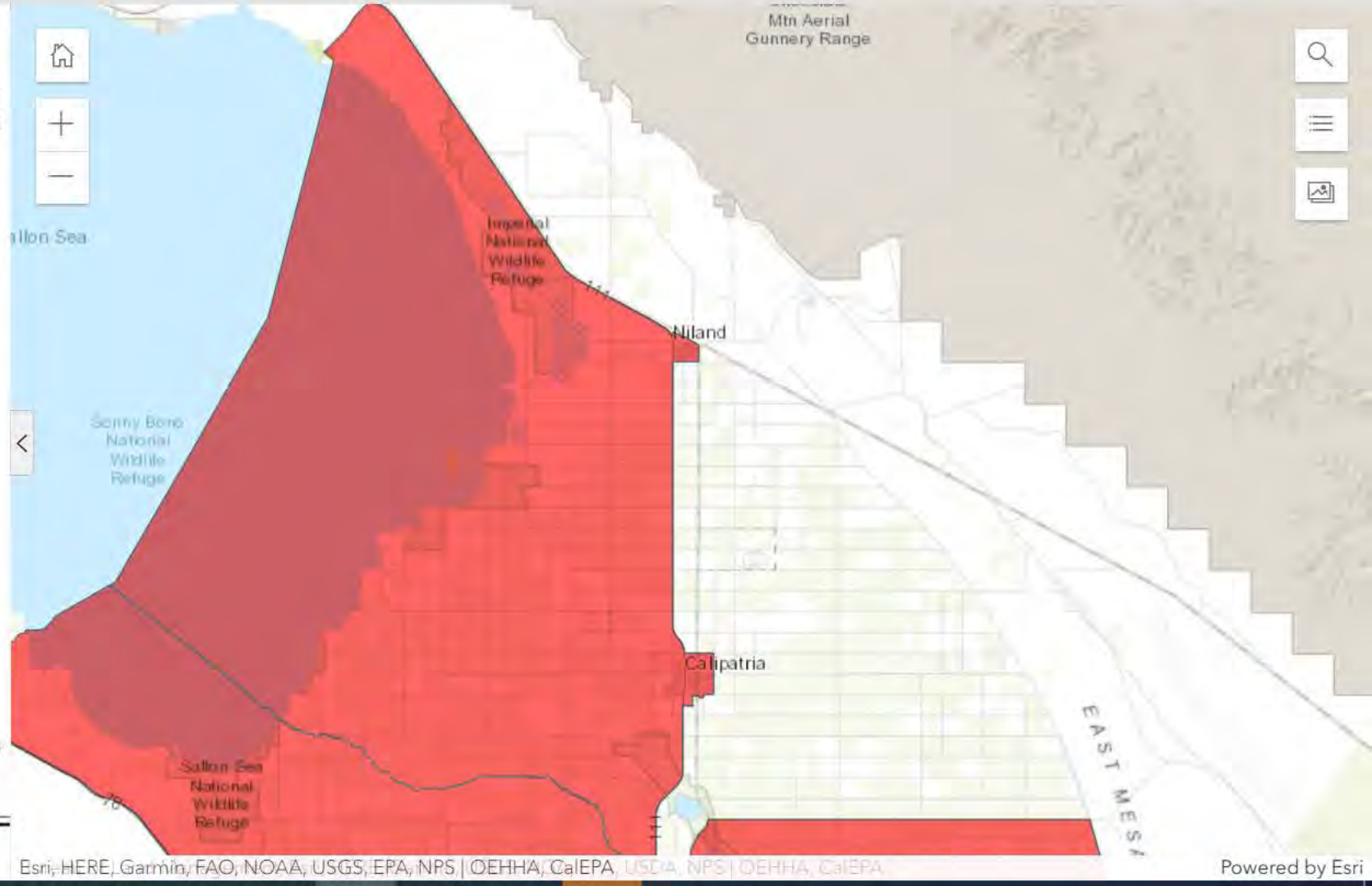
CalEPA SB 535 Page | CalEnviroScreen 4.0 | About

California Climate Investments are funds (Greenhouse Gas Reduction Fund and appropriated by the Legislature) from the proceeds of the State's Cap-and-Trade Program specifically targeted for investment in disadvantaged communities in California. These funds must be used for programs that further reduce emissions of greenhouse gases.

Senate Bill 535 (De León, Statutes of 2012) directed that at least a quarter of the proceeds go to projects that provide a benefit to disadvantaged communities and at least 10 percent of the funds go to projects located within those communities. The legislation gives CalEPA the responsibility for identifying those communities.

How to use this map

- Use your mouse or touchpad to pan around.
- Zoom in/out with a mouse wheel or the +/- icons.
- Search by location or census tract number with the **search icon**.
- Click on a census tract to view additional information in the pop-up window.
- Dock the pop-up window to the side of the screen by clicking the **dock** icon.
- Export a map view that includes the legend and popup using the **screenshot** widget.
- Click the links in the header to view additional resources related to SB 535 Disadvantaged Communities



https://experience.arcgis.com/experience/1c21c53da8de48f1b946f3402fbae55c/page/SB-535-Disadvantaged-Communities/

SB 535 Disadvantaged Communities (2022 Update)

CalEPA SB 535 Page | CalEnviroScreen 4.0 | About

California Climate Investments are funds (Greenhouse Gas Reduction Fund and appropriated by the Legislature) from the proceeds of the State's Cap-and-Trade Program specifically targeted for investment in disadvantaged communities in California. These funds must be used for programs that further reduce emissions of greenhouse gases.

Senate Bill 535 (De León, Statutes of 2012) directed that at least a quarter of the proceeds go to projects that provide a benefit to disadvantaged communities and at least 10 percent of the funds go to projects located within those communities. The legislation gives CalEPA the responsibility for identifying those communities.

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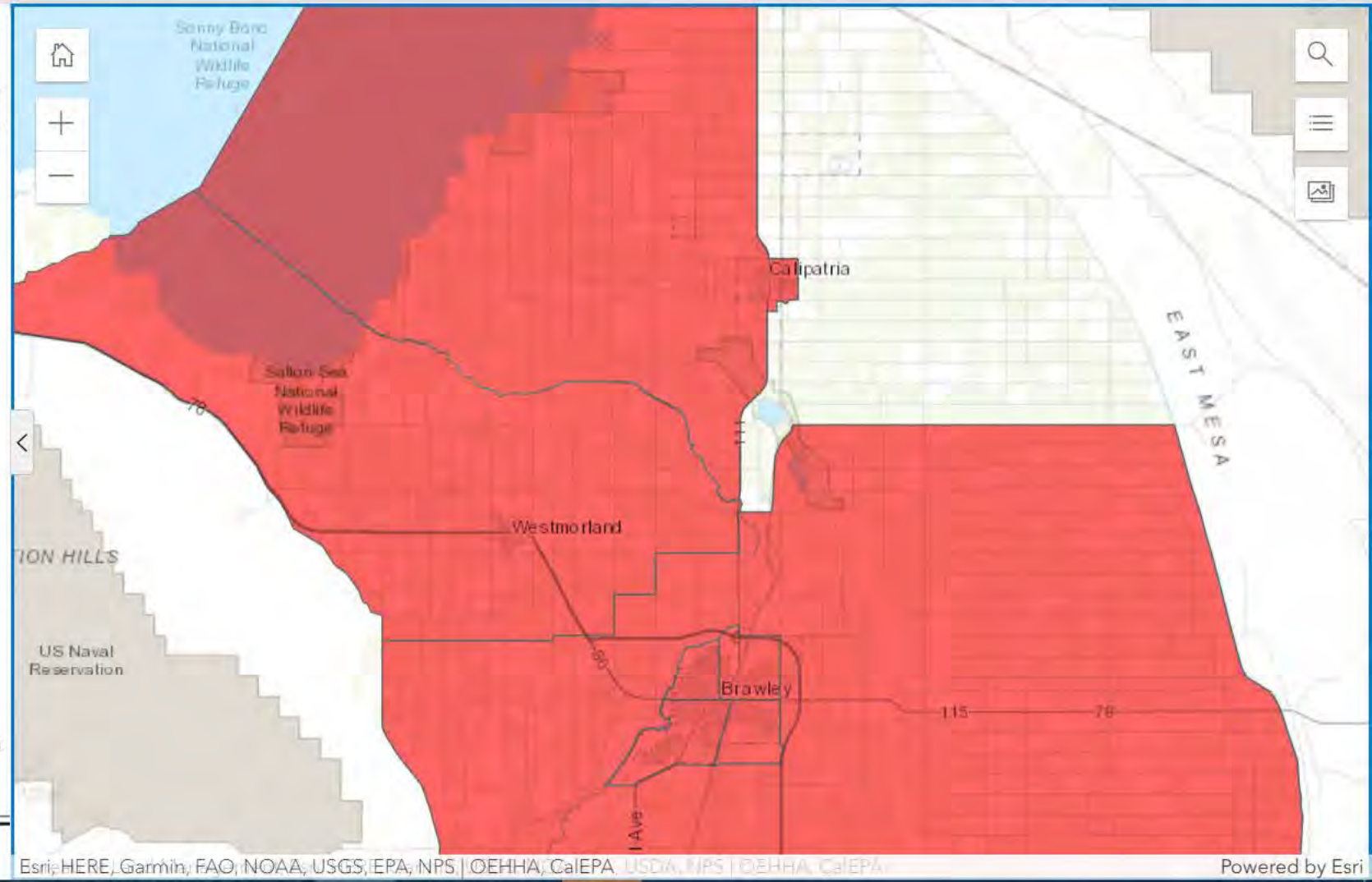
- Export a map view that includes the legend and popup using the **screenshot** widget.
- Click the links in the header to view additional resources related to SB 535 Disadvantaged Communities



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SB 535 Disadvantaged Communities (2022 Update)

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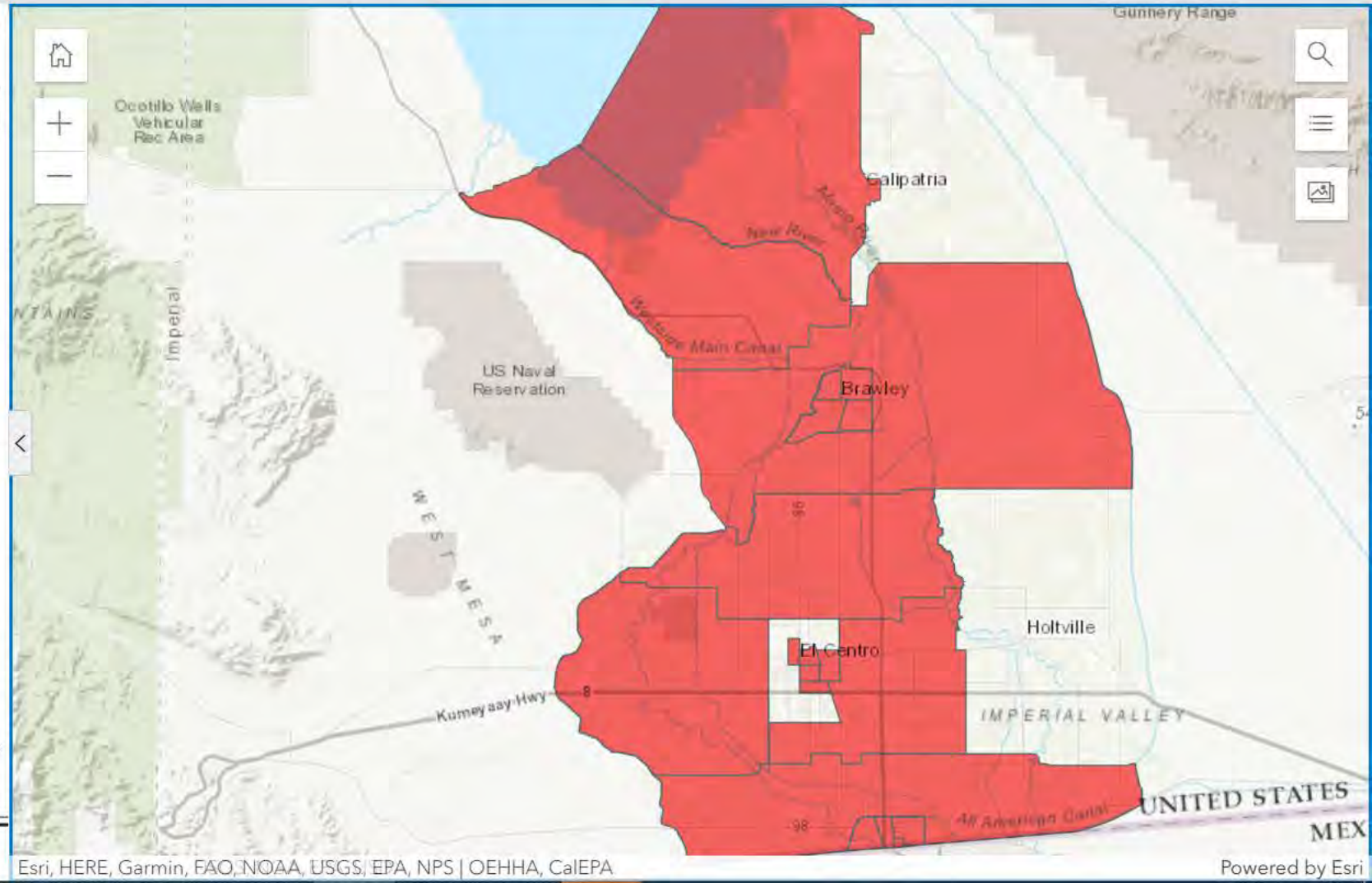

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CalEnviroScreen 4.0

from OEHHA

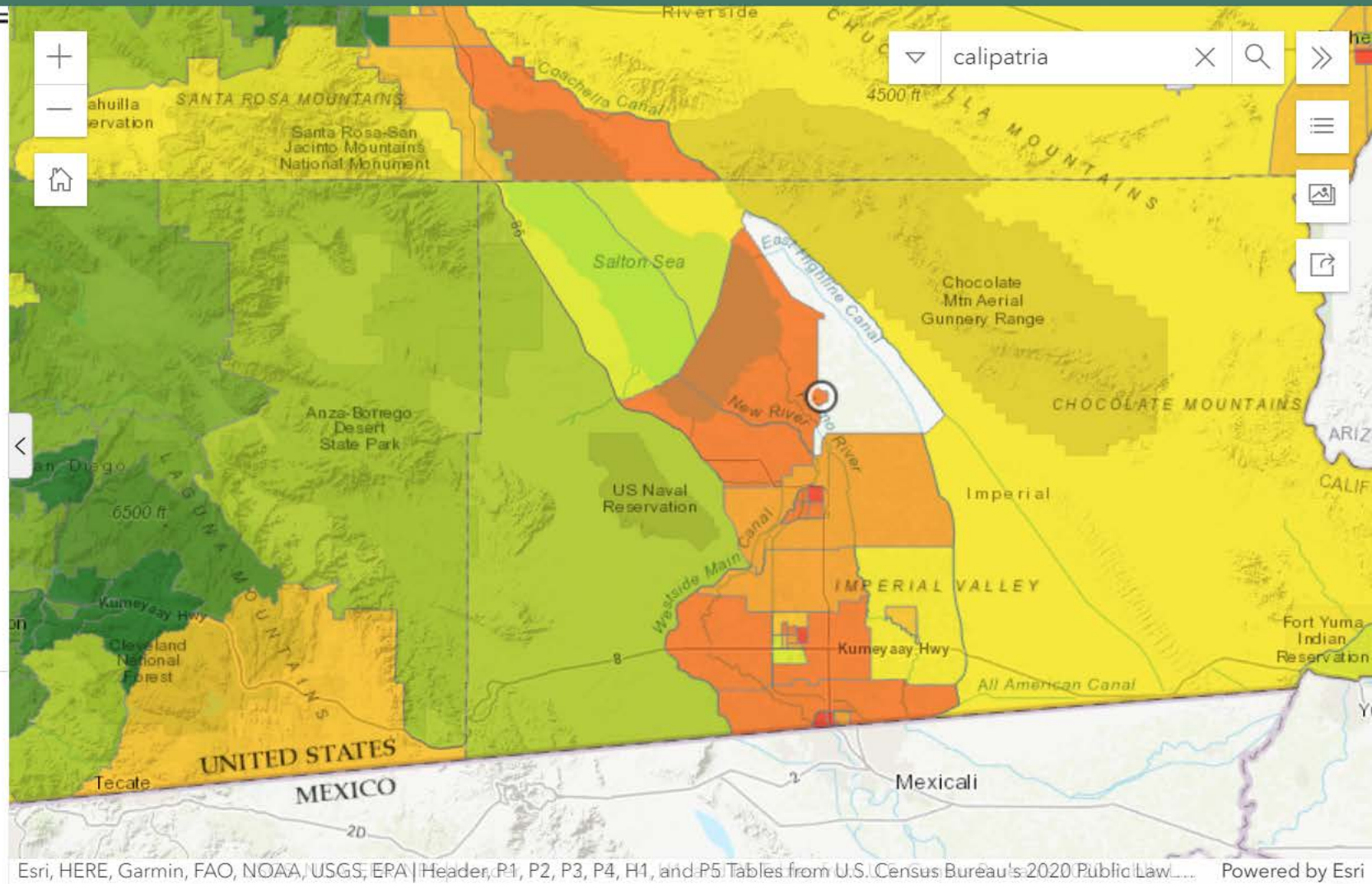
SB 535 Disadvantaged Communities Map | CalEnviroScreen Website | Indicator Maps | About

Overall Percentile

CalEnviroScreen 4.0 Results

- >90 - 100 (Highest Scores)
- >80 - 90
- >70 - 80
- >60 - 70
- >50 - 60
- >40 - 50
- >30 - 40
- >20 - 30
- >10 - 20
- 0 - 10 (Lowest Scores)

CalEnviroScreen 4.0 High Pollution, Low Population



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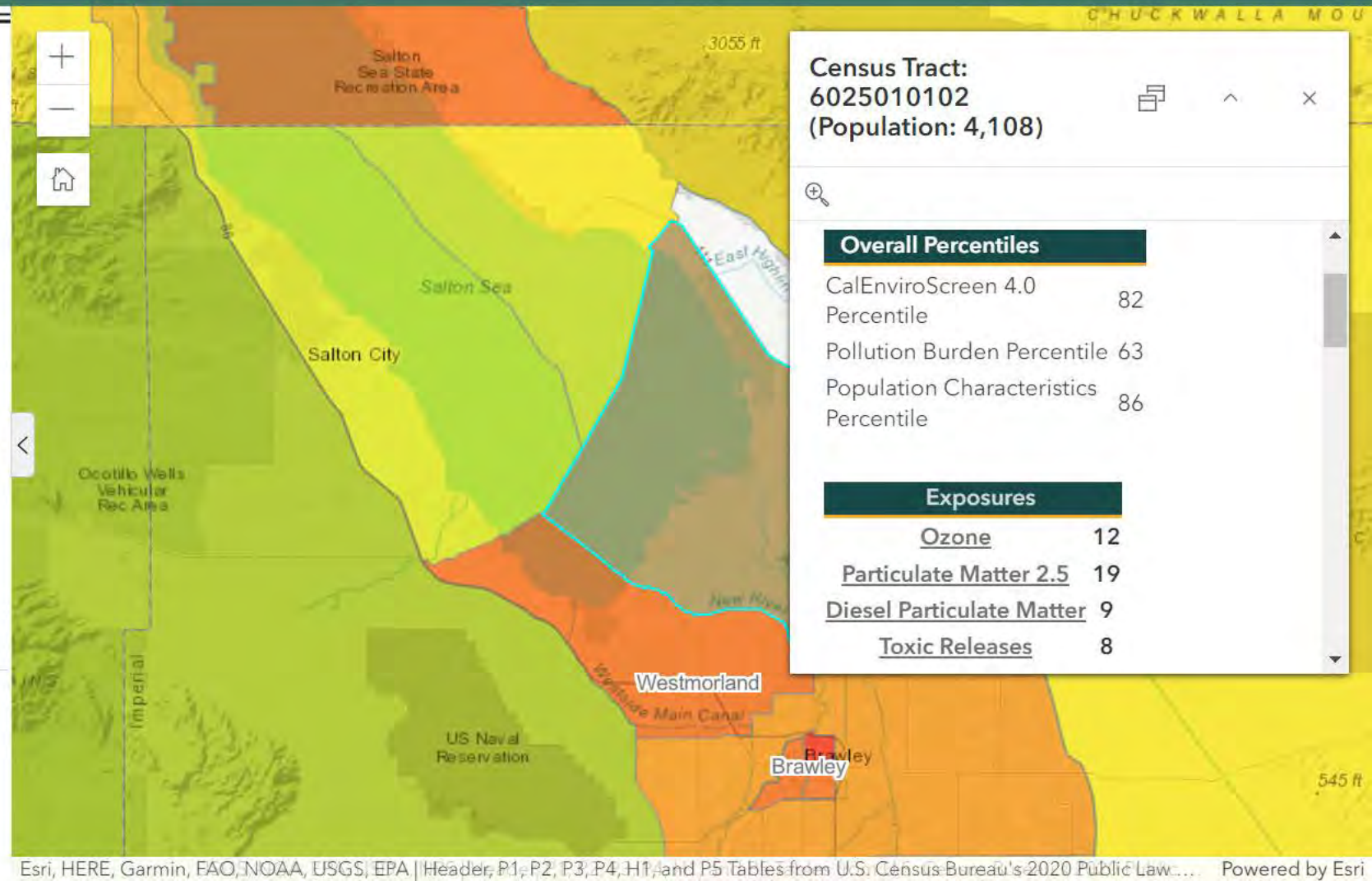

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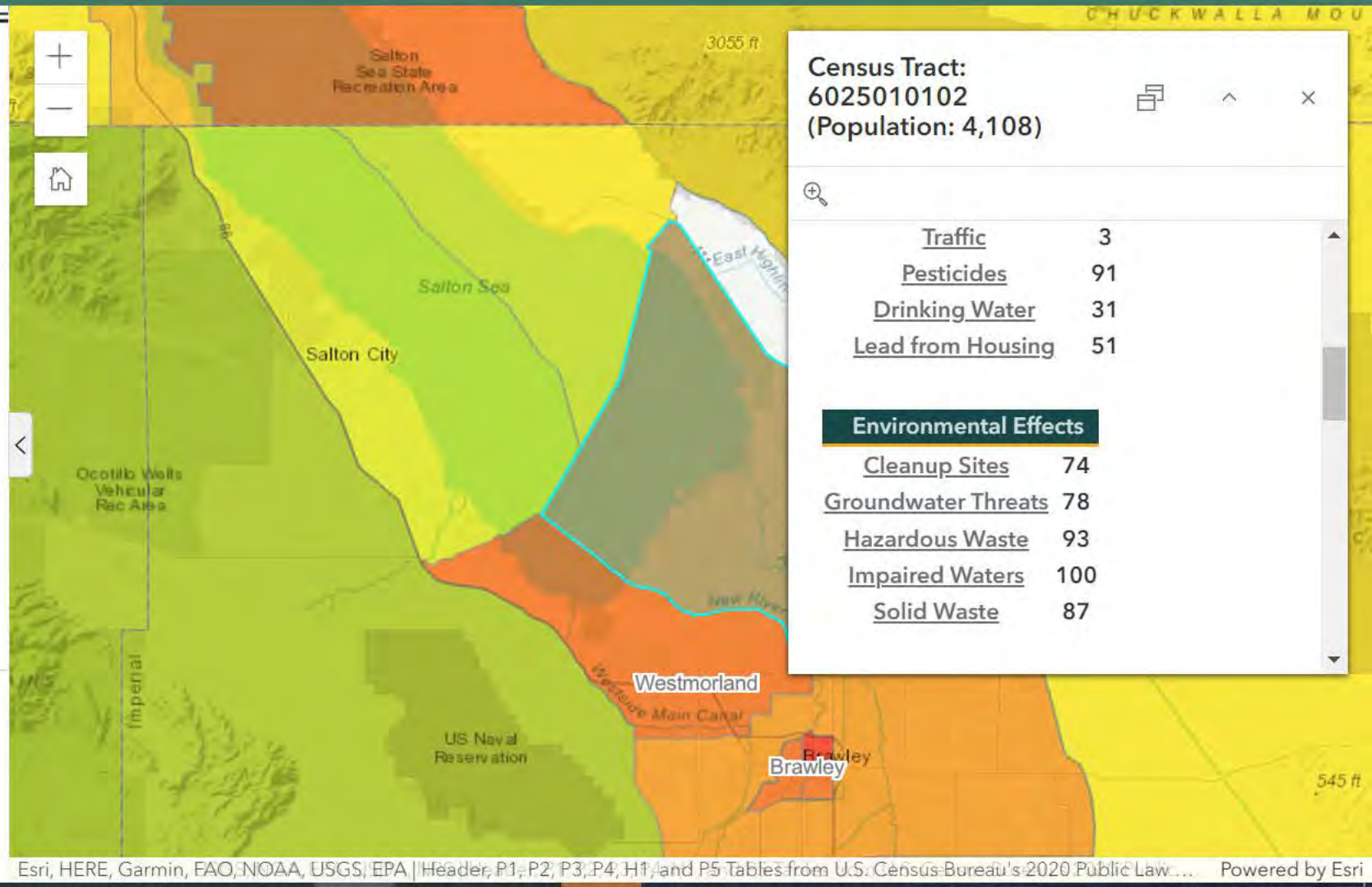

Census Tract: 6025010102 (Population: 4,108)

Traffic	3
Pesticides	91
Drinking Water	31
Lead from Housing	51

Environmental Effects

Cleanup Sites	74
Groundwater Threats	78
Hazardous Waste	93
Impaired Waters	100
Solid Waste	87

CalEnviroScreen 4.0

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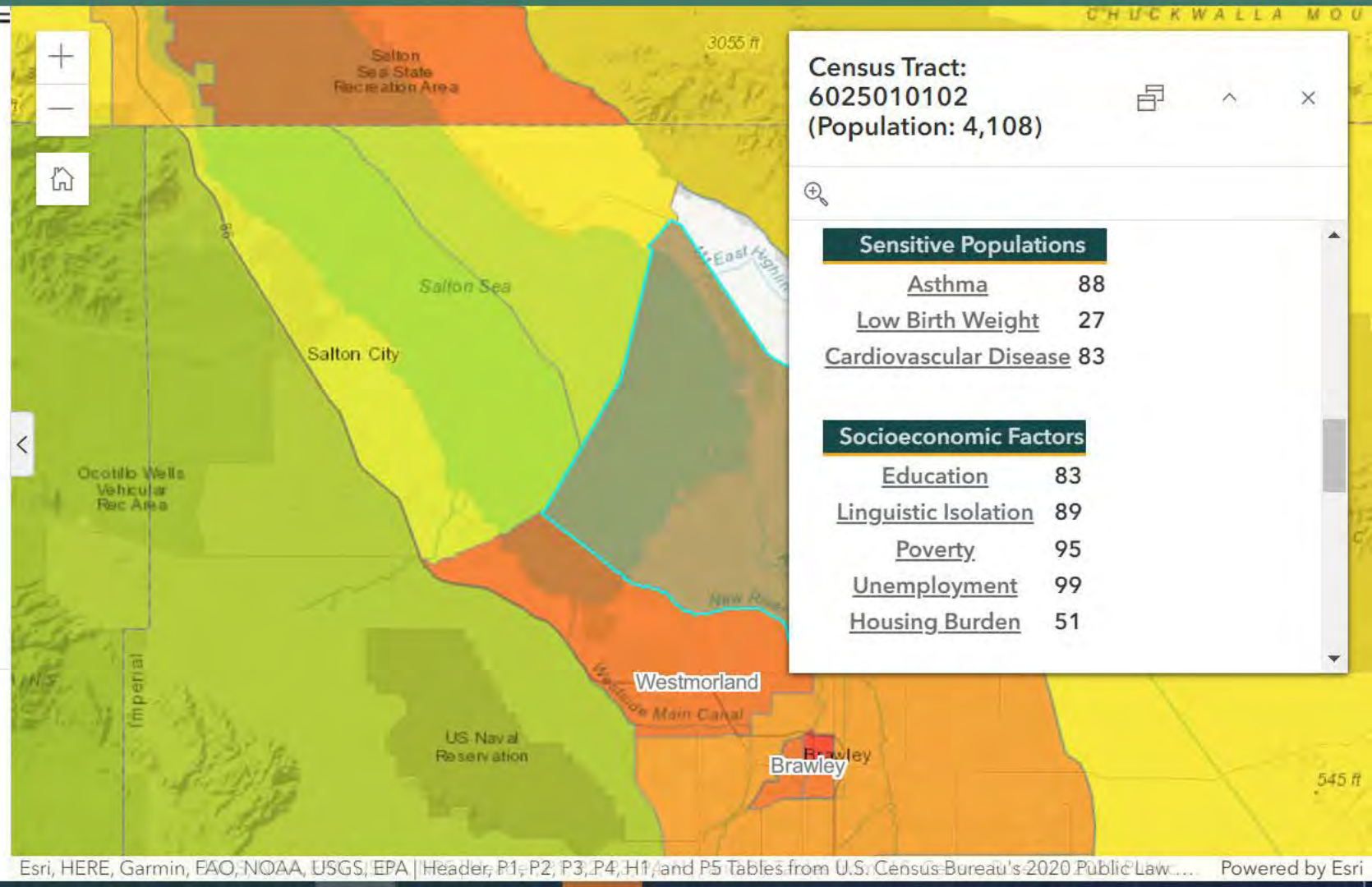

Census Tract: 6025010102 (Population: 4,108)

Sensitive Populations	
Asthma	88
Low Birth Weight	27
Cardiovascular Disease	83

Socioeconomic Factors	
Education	83
Linguistic Isolation	89
Poverty	95
Unemployment	99
Housing Burden	51

CalEnviroScreen 4.0

from OEHHA

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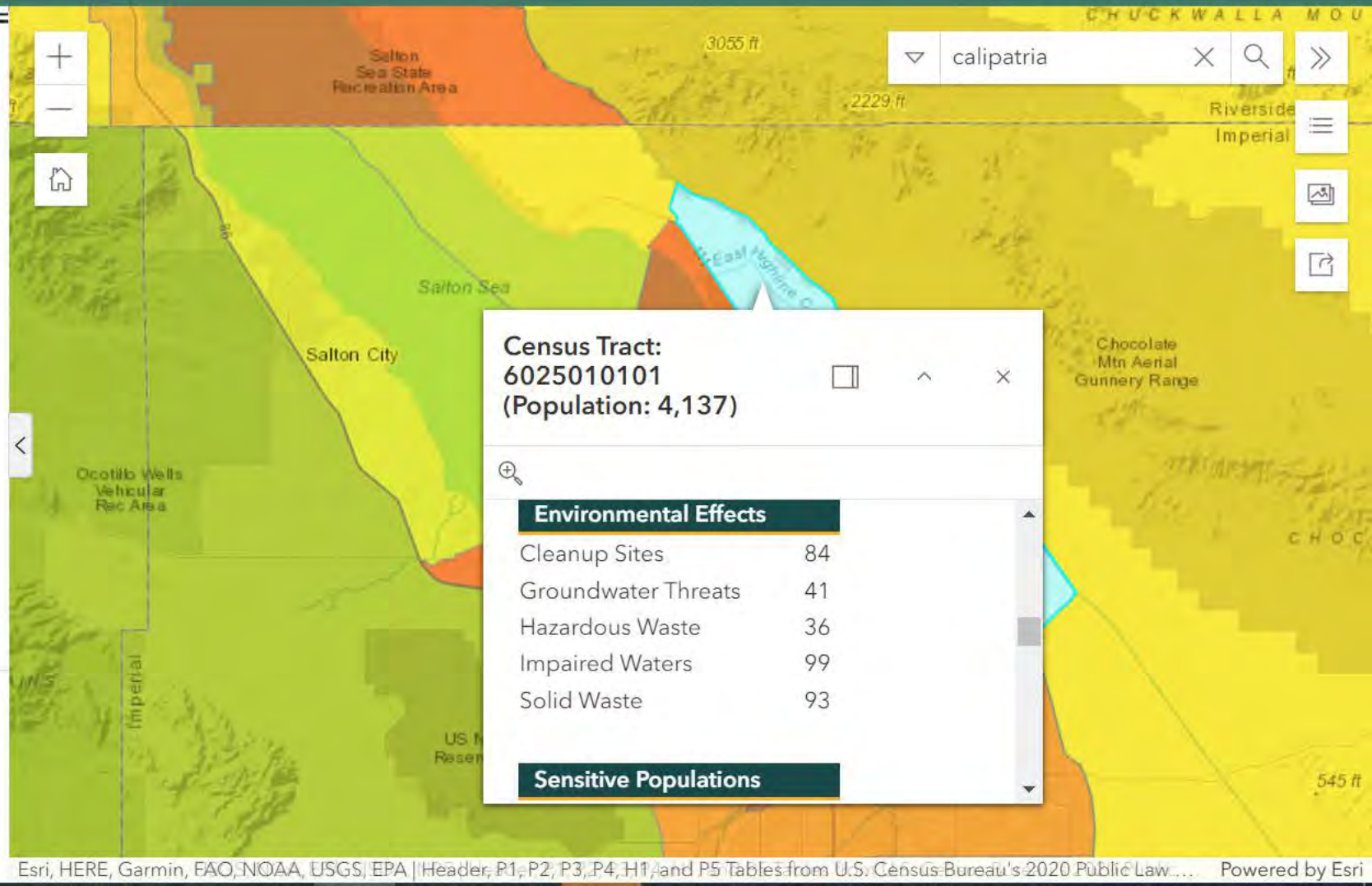

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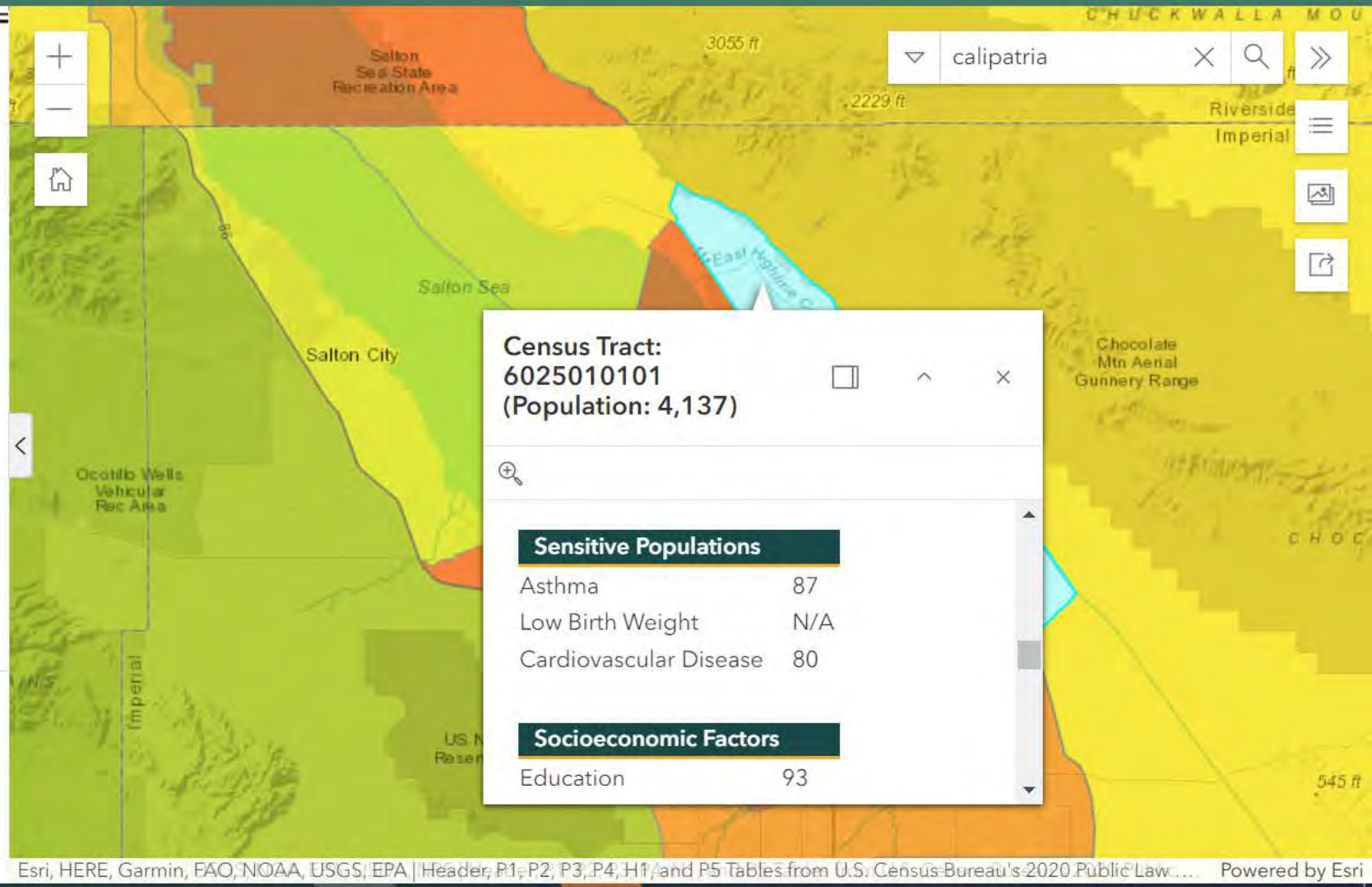

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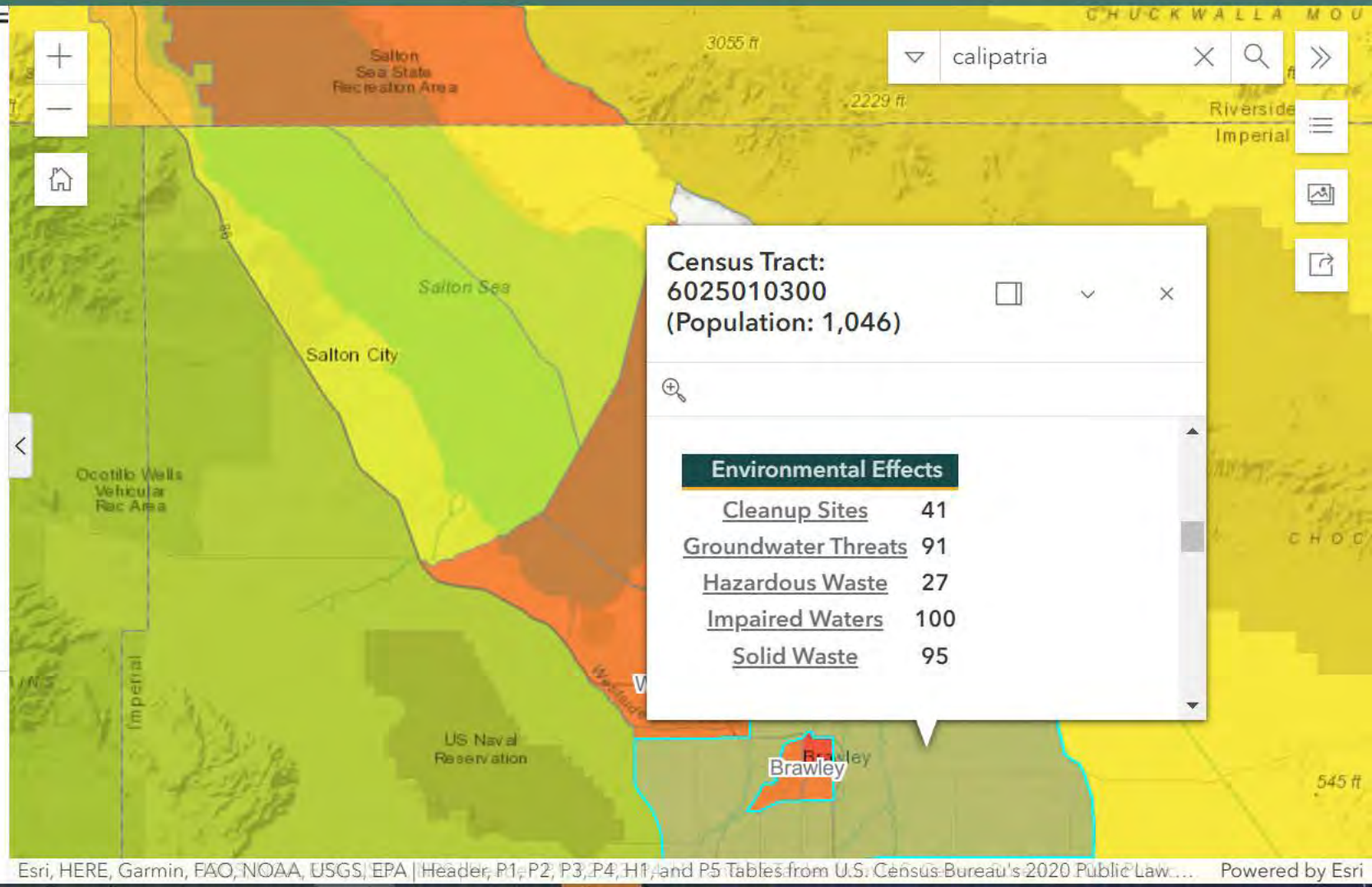

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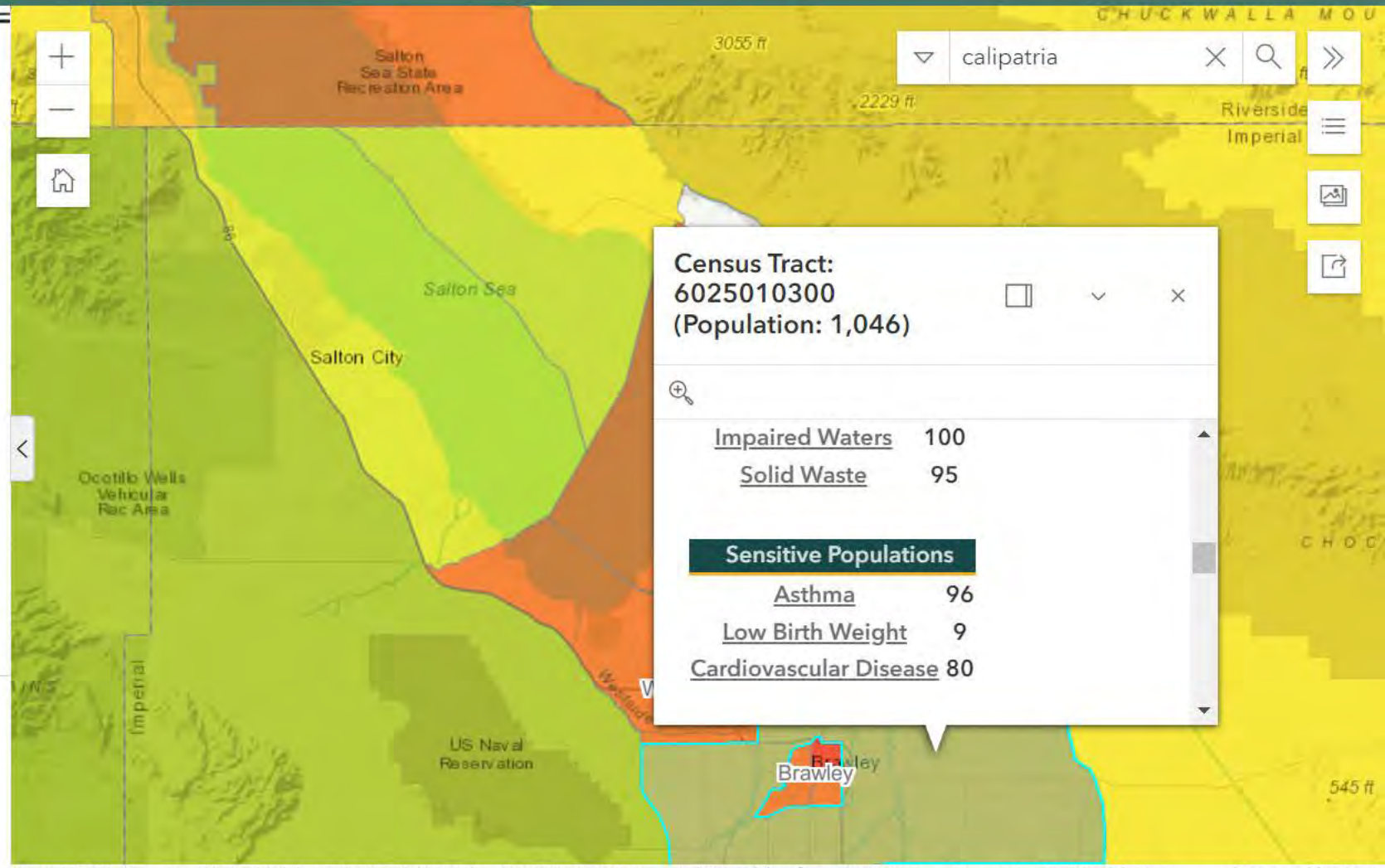

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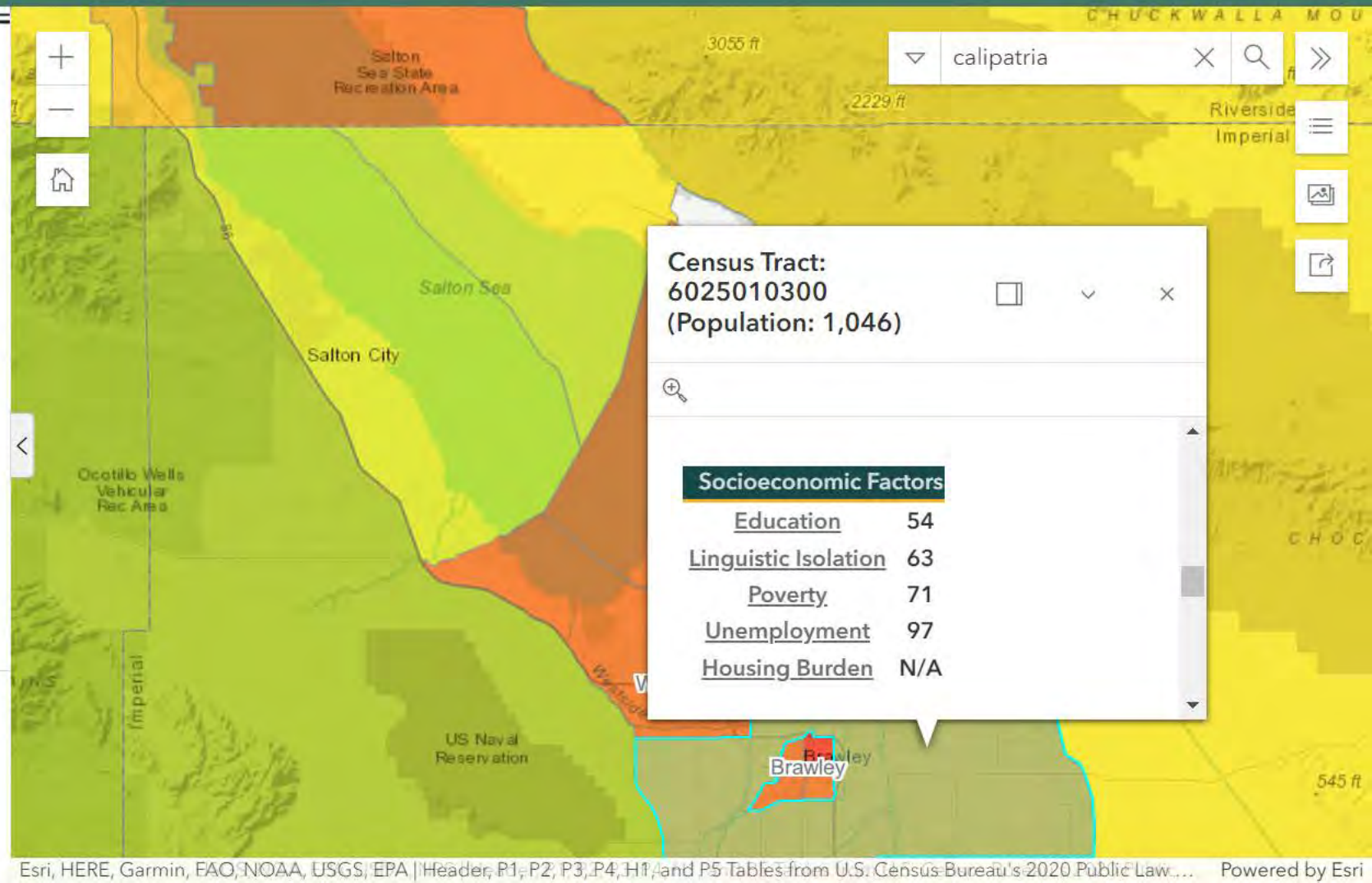

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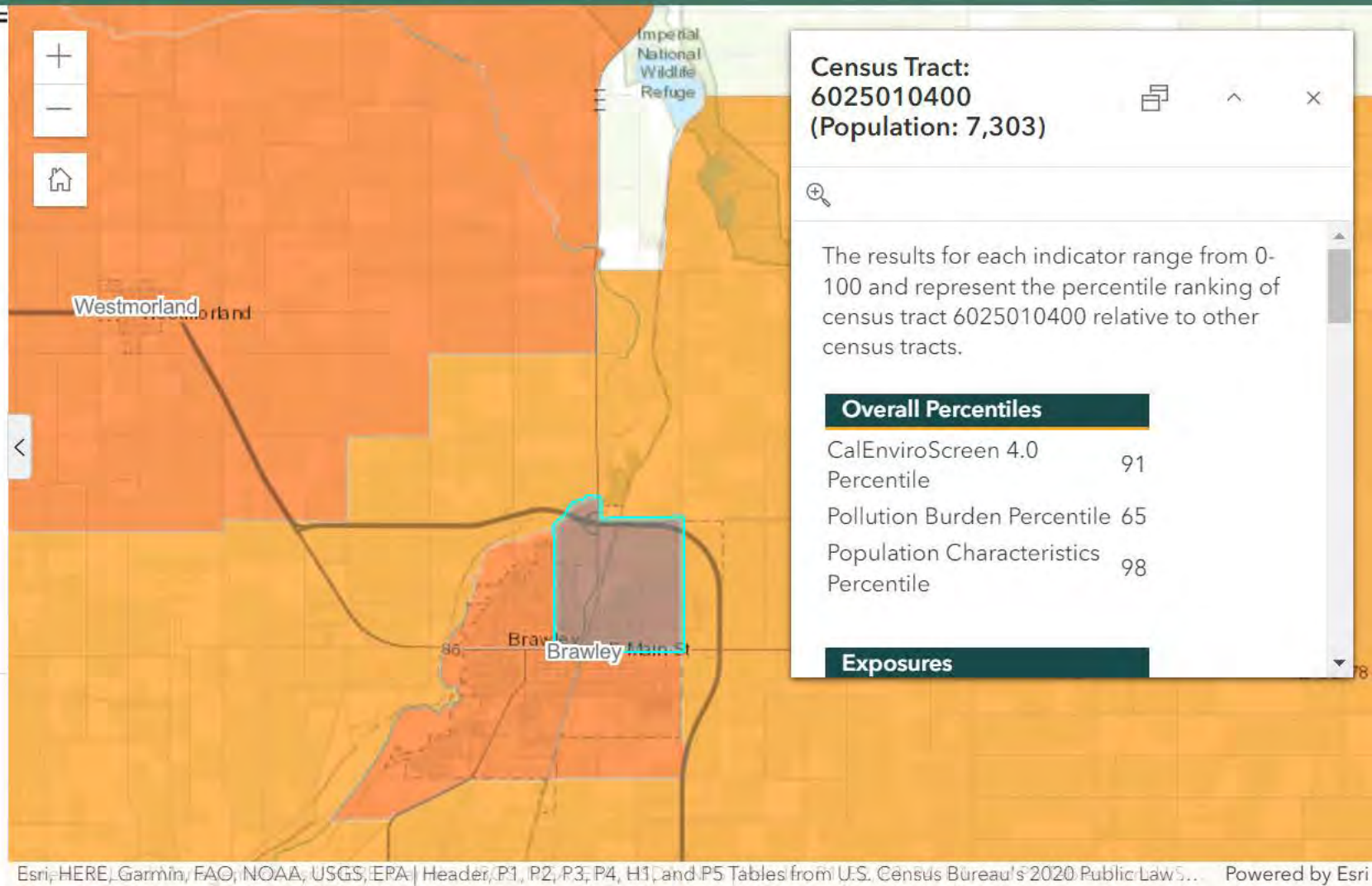

Census Tract: 6025010400 (Population: 7,303)

The results for each indicator range from 0-100 and represent the percentile ranking of census tract 6025010400 relative to other census tracts.

Overall Percentiles	
CalEnviroScreen 4.0 Percentile	91
Pollution Burden Percentile	65
Population Characteristics Percentile	98

Exposures

https://experience.arcgis.com/experience/11d2f52282a54ceebcac7428e6184203/page/CalEnviroScreen-4_0/

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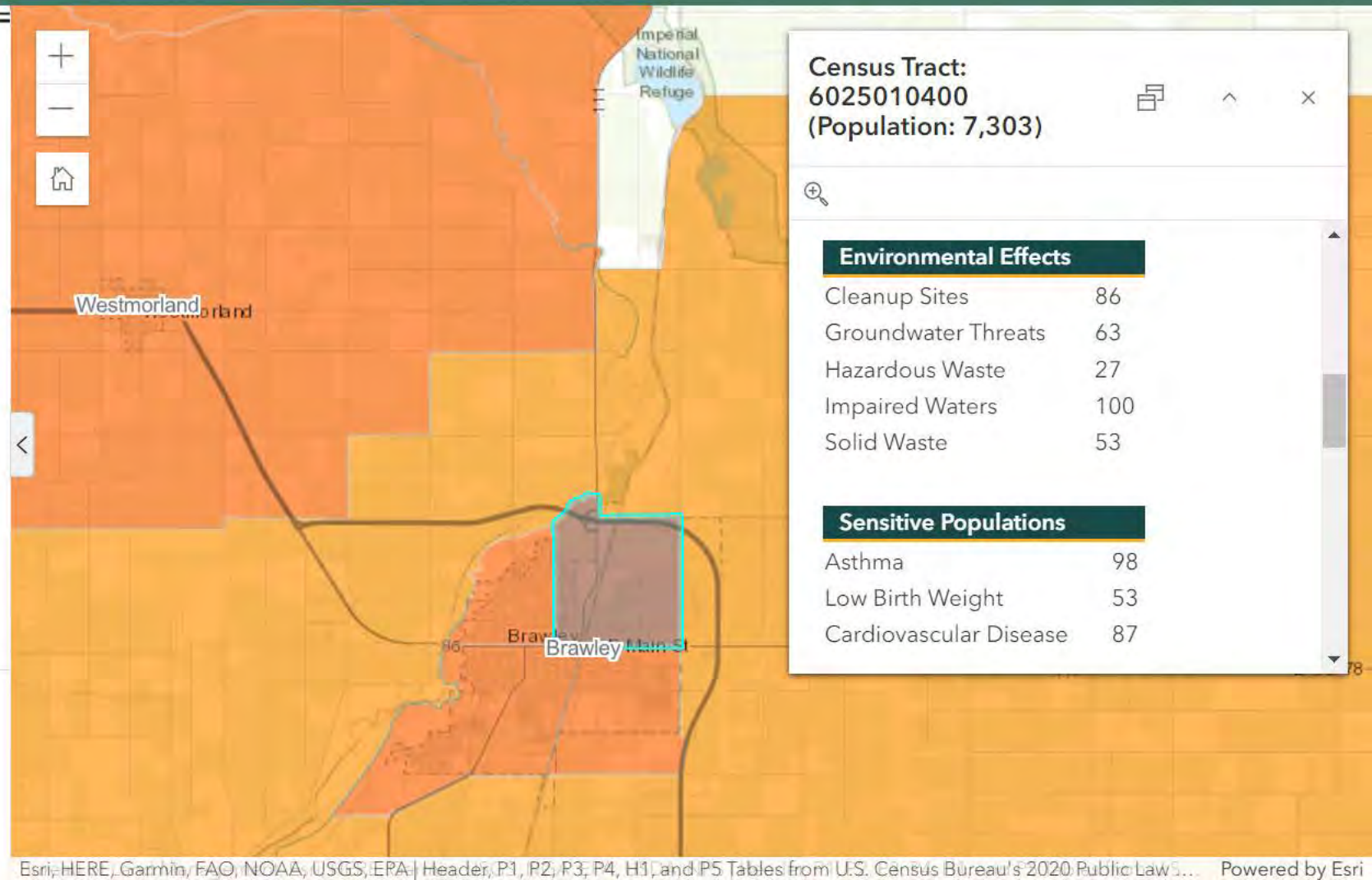

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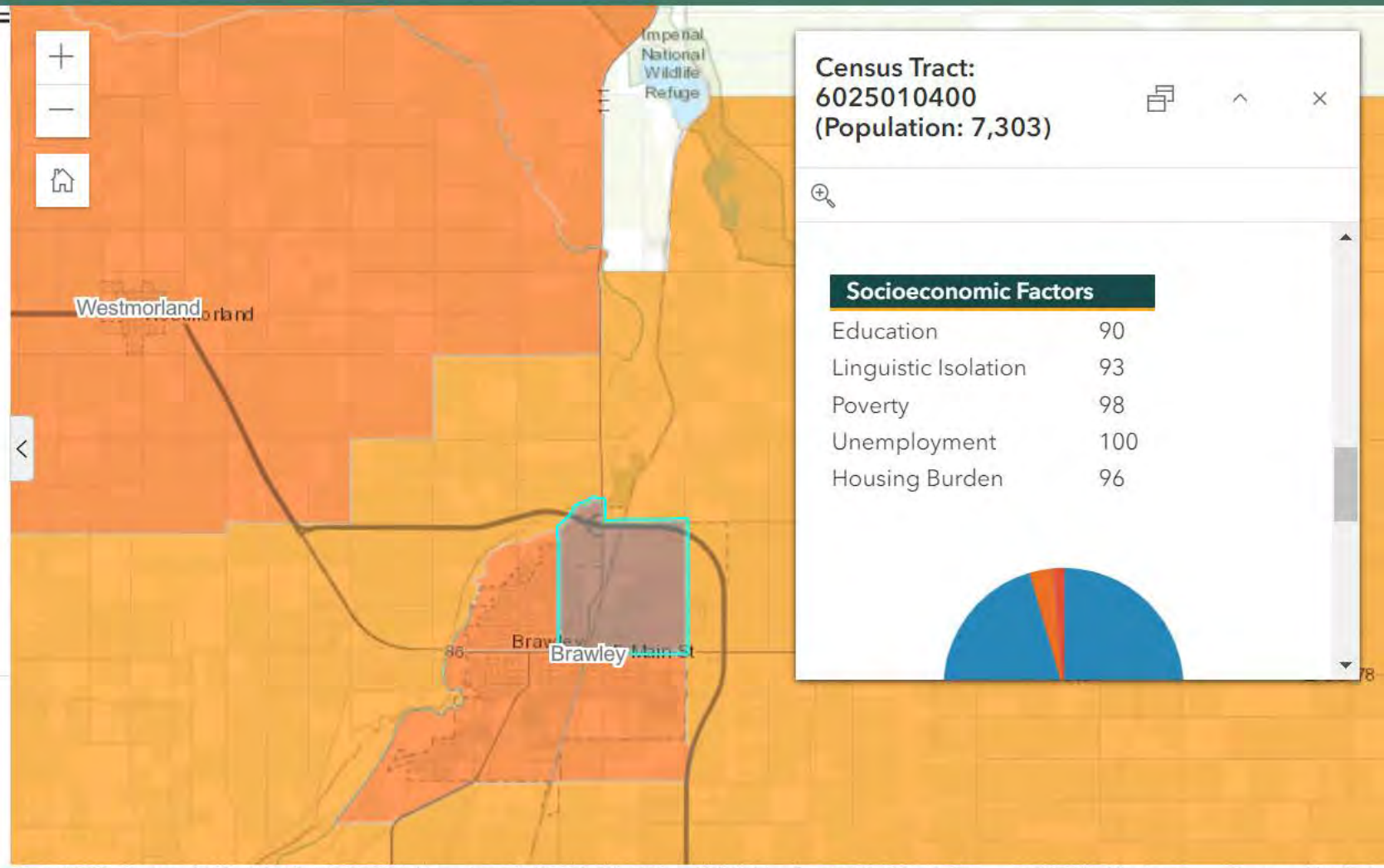

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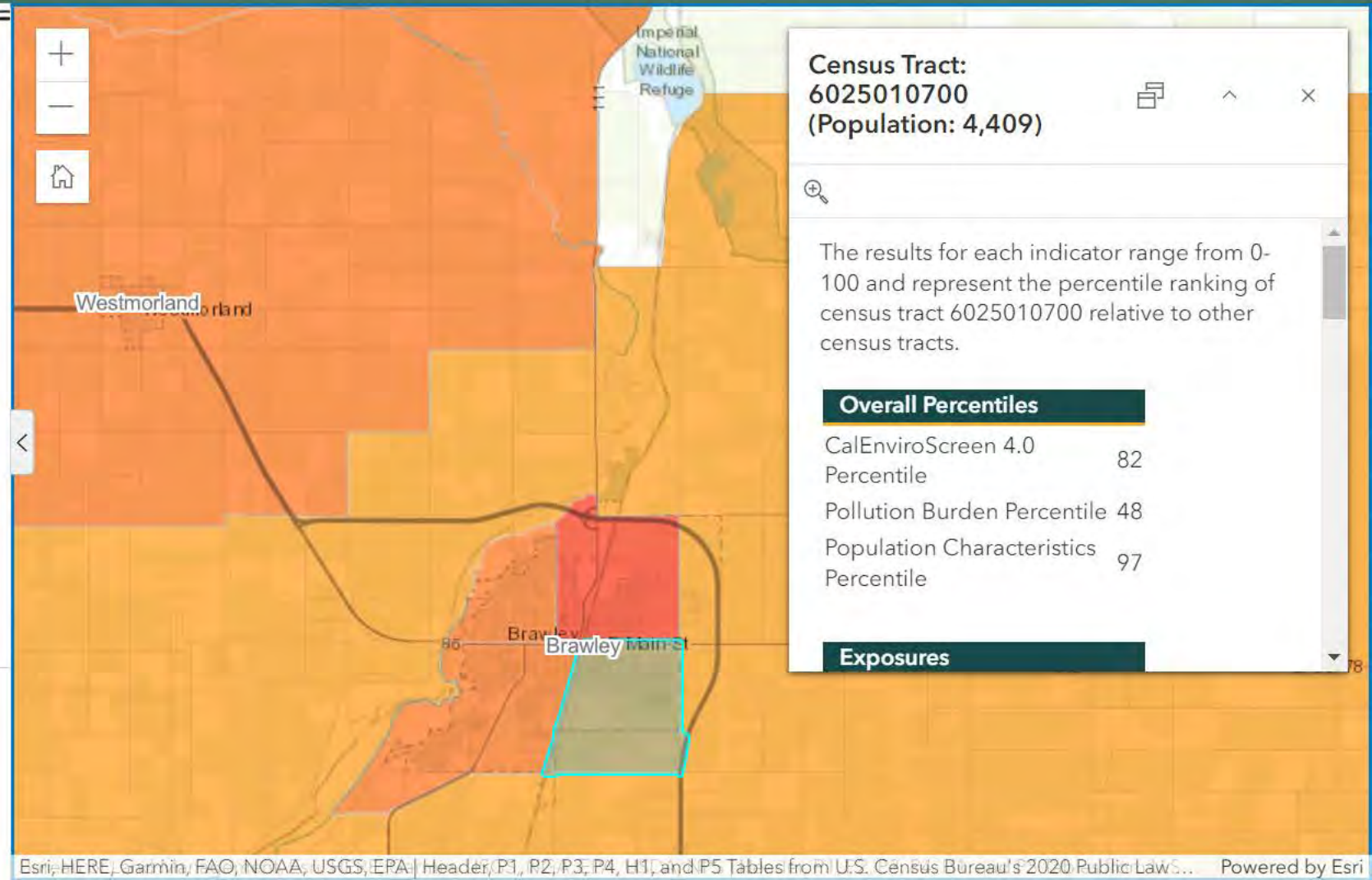

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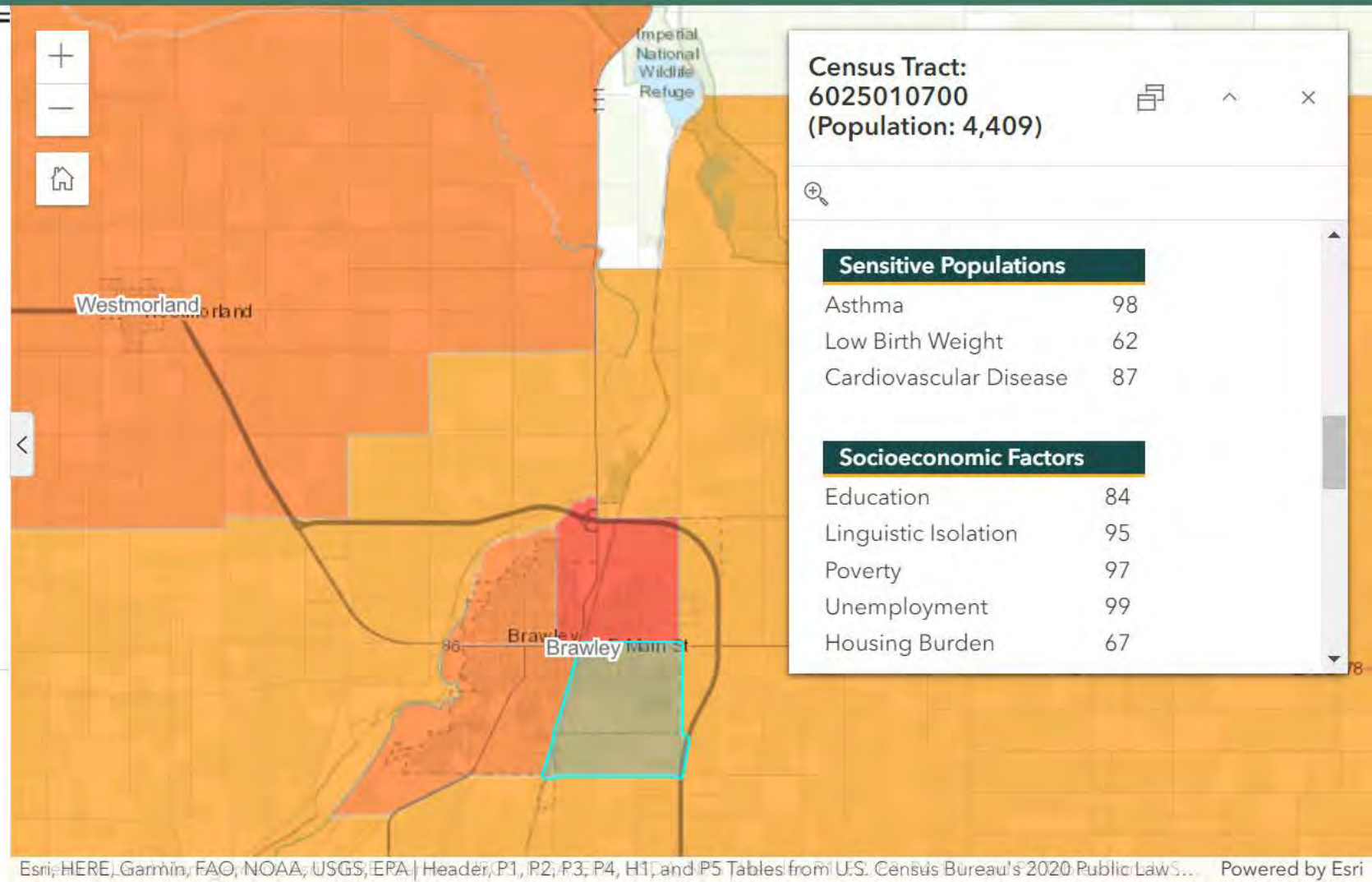

Census Tract: 6025010700 (Population: 4,409)

Sensitive Populations	
Asthma	98
Low Birth Weight	62
Cardiovascular Disease	87

Socioeconomic Factors	
Education	84
Linguistic Isolation	95
Poverty	97
Unemployment	99
Housing Burden	67

CalEnviroScreen 4.0

from OEHHA

Overall Percentile

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- >80 - 90
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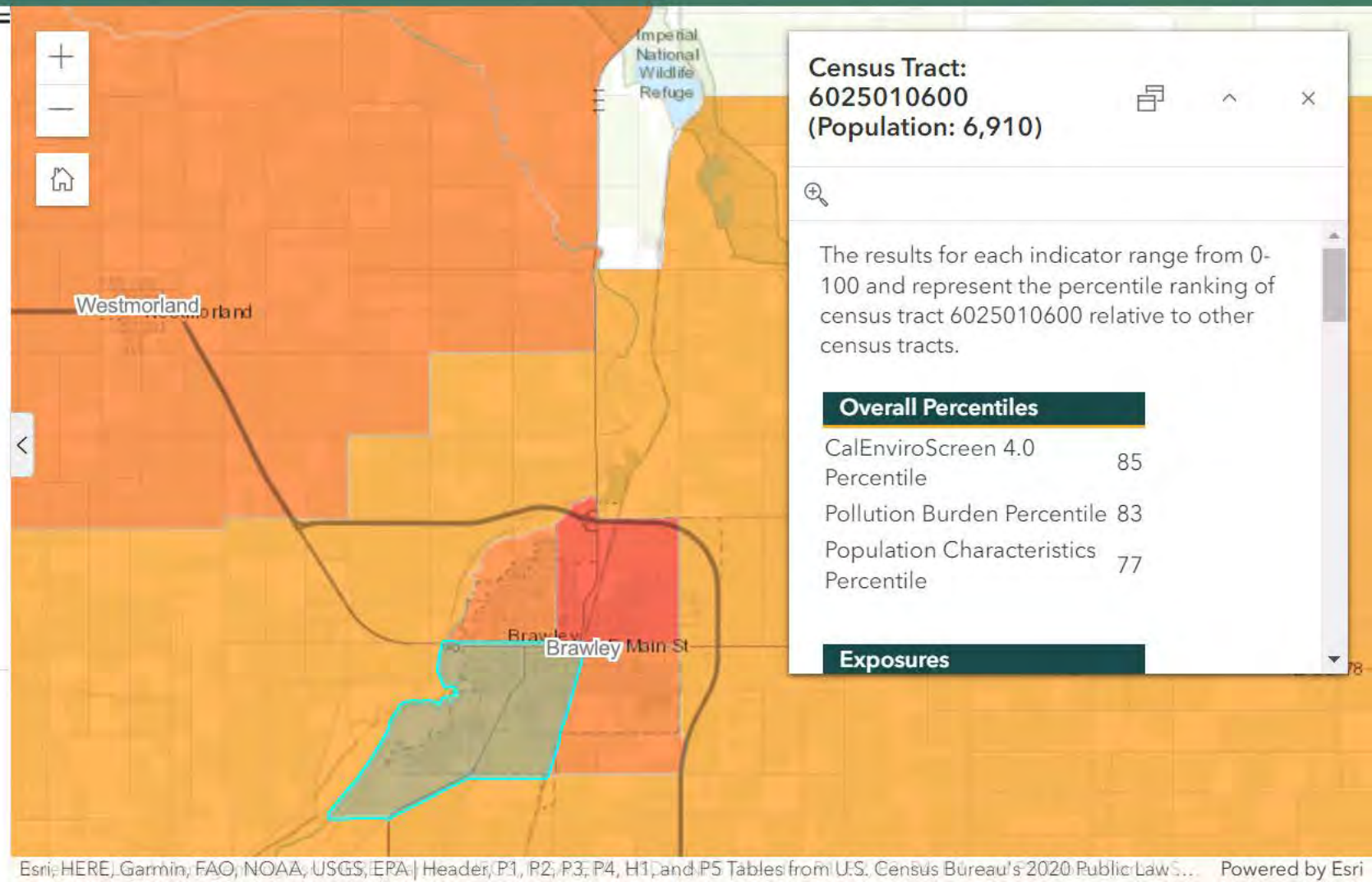
CalEnviroScreen 4.0 High Pollution, Low Population



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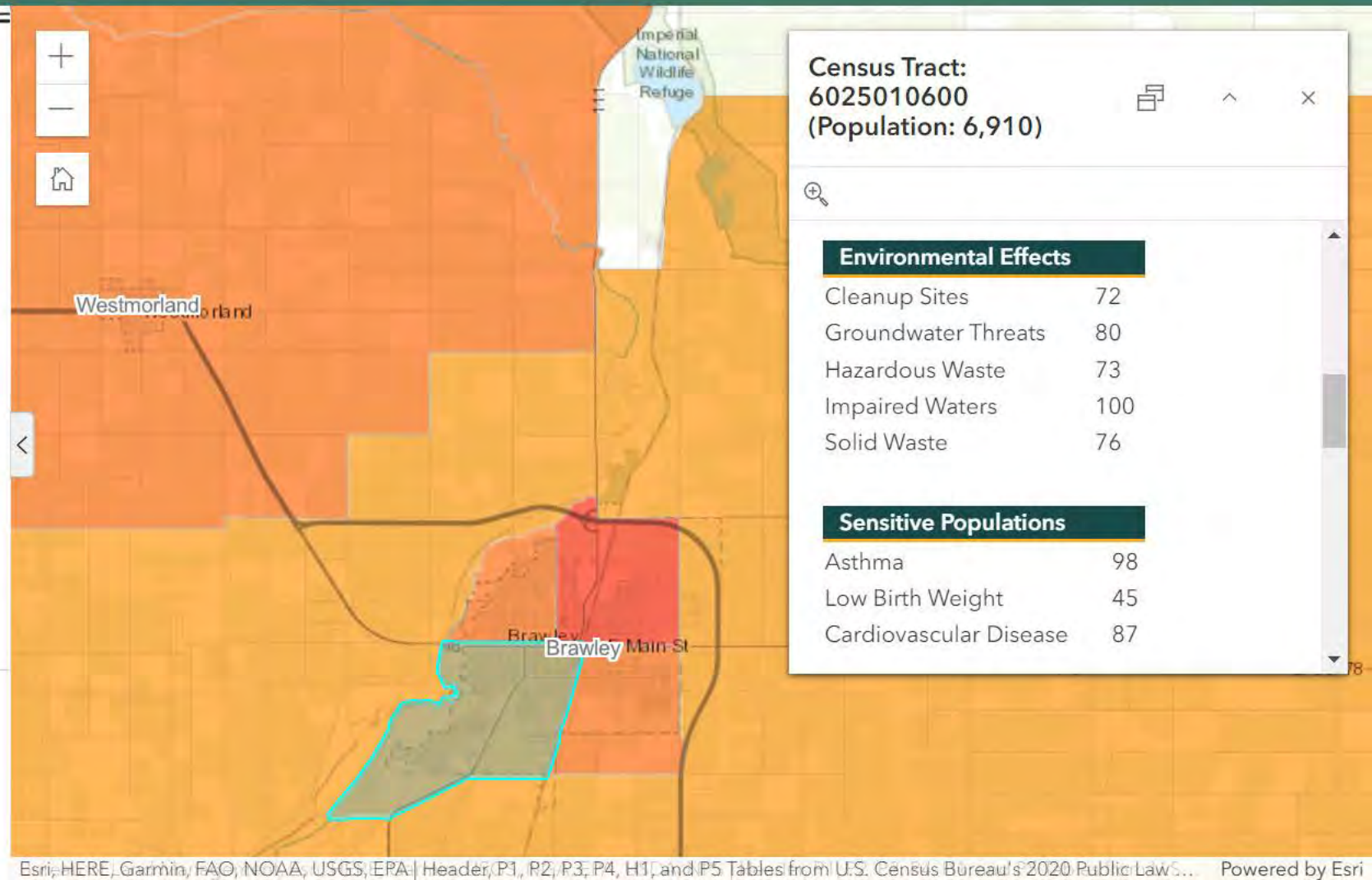

Census Tract: 6025010600 (Population: 6,910)

Environmental Effects	
Cleanup Sites	72
Groundwater Threats	80
Hazardous Waste	73
Impaired Waters	100
Solid Waste	76

Sensitive Populations	
Asthma	98
Low Birth Weight	45
Cardiovascular Disease	87

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from OEHHA

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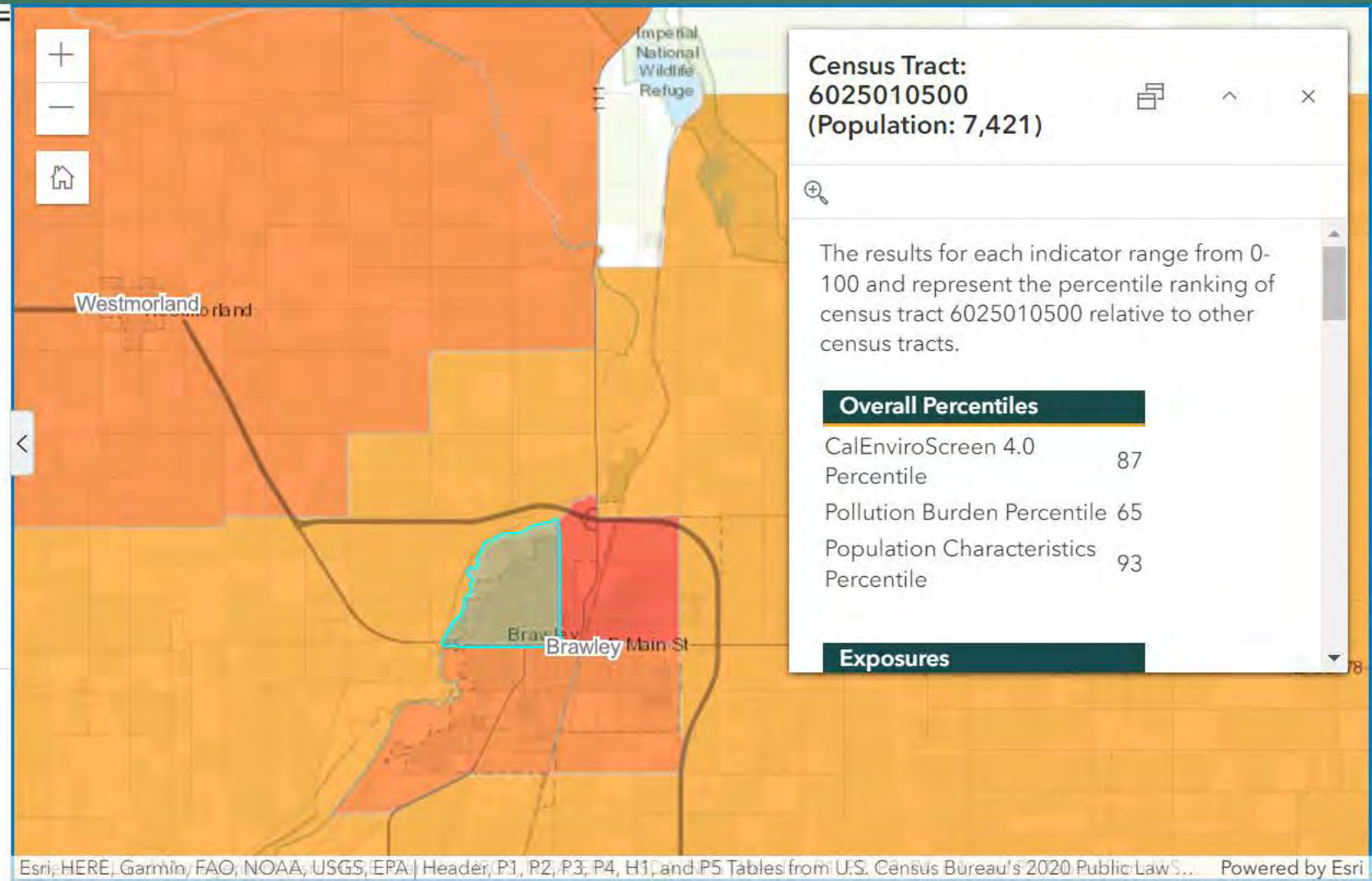

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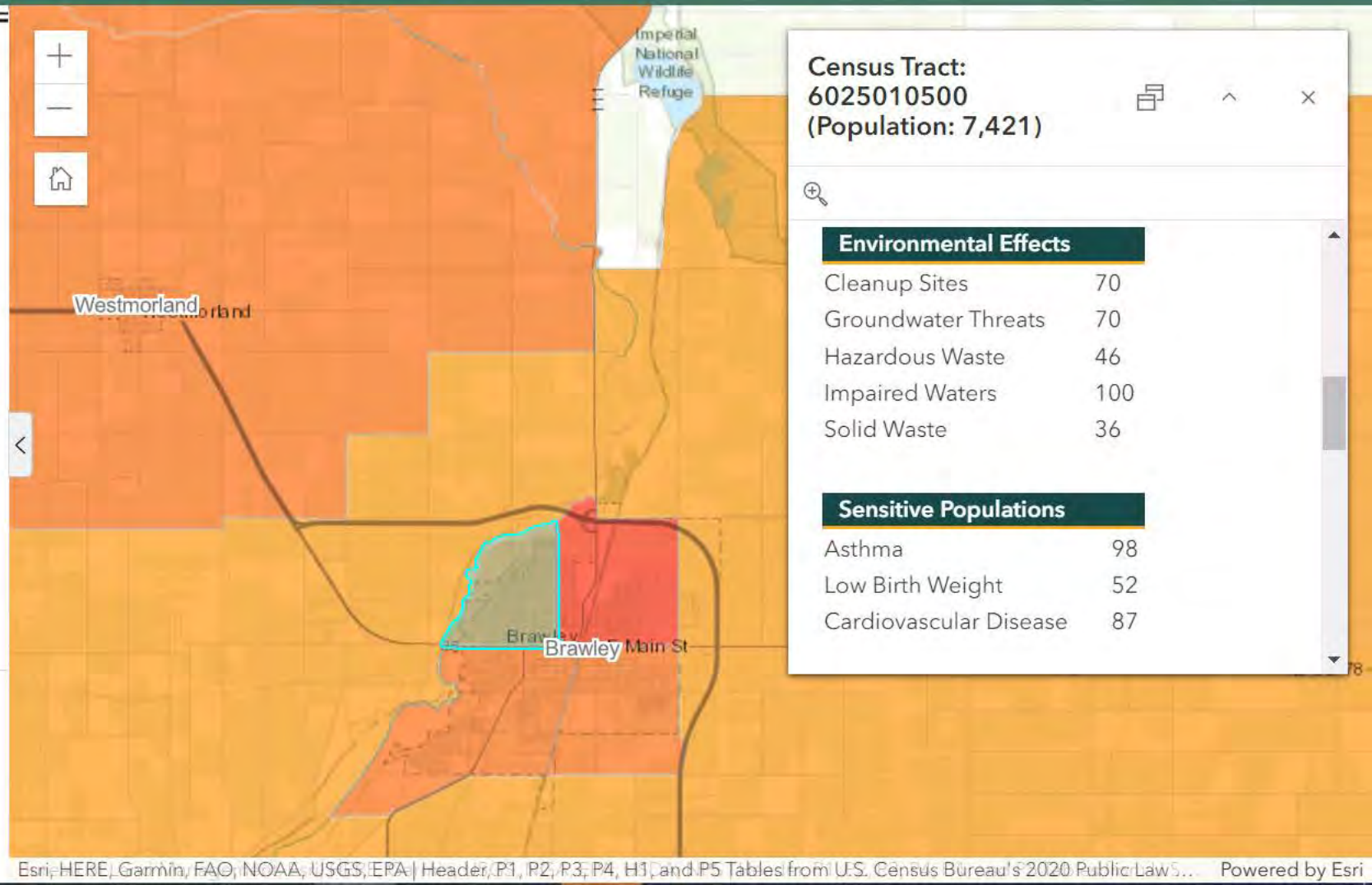


Census Tract: 6025010500 (Population: 7,421)

Environmental Effects	
Cleanup Sites	70
Groundwater Threats	70
Hazardous Waste	46
Impaired Waters	100
Solid Waste	36

Sensitive Populations	
Asthma	98
Low Birth Weight	52
Cardiovascular Disease	87

Esri, HERE, Garmin, FAO, NOAA, USGS, EPA | Header, P1, P2, P3, P4, H1, and P5 Tables from U.S. Census Bureau's 2020 Public Law... Powered by Esri

Environmental Justice Task Force

Imperial County Initiative Report

CalEPA
California Environmental Protection Agency

CalEPA
California Environmental Protection Agency

Environmental Justice Task Force

Imperial County Initiative Report

Gavin Newsom
Governor

Jared Blumenfeld
Secretary for Environmental Protection

Table of Contents

Introduction

In 2018, the California Environmental Protection Agency Environmental Justice Task Force (EJ Task Force) initiated an effort in Imperial County for a focused environmental enforcement and regulatory compliance initiative. This effort is referred to in this report as the Imperial County EJ Initiative or the Initiative. At the outset of the Imperial County EJ Initiative, the EJ Task Force worked with residents, the local environmental justice organization Comite Civico Del Valle, Inc. (CCV), as well as local regulatory agencies, to learn more about environmental challenges and concerns affecting the county and its residents. The EJ Task Force's goal in this initial phase of the Initiative was to identify locations where focused environmental enforcement and compliance efforts and regulatory agency data gathering, would have a significant impact.

Based on the input received from the community, the EJ Task Force conducted multi-agency inspections at various industrial, agricultural and other locations in the county. Businesses found to be in violation of environmental regulations were cited and ordered to remediate their violations, and are being monitored closely to ensure they come into compliance with regulatory requirements. During the Initiative, CalEPA enforcement staff also worked with local regulatory agencies to engage agricultural stakeholders on best practices, to support solid waste cleanup efforts, to reduce illegal off-road vehicle activity in restricted areas of the desert, and to provide safe pesticide use trainings to field workers and to day care providers who use pesticides at their day care locations.

This report provides the results of the Imperial County EJ Initiative.

Background

Environmental justice recognizes that many communities in California continue to bear disproportionate pollution burdens, while also facing serious socioeconomic, health, and other challenges. These communities have long voiced their concerns about the pollution burdens they experience. Among those concerns are land use decisions that place multiple sources of pollution in or near their neighborhoods, exposing them to the associated risks of adverse health effects. Residents of these communities have also expressed concern about perceived lax enforcement of environmental regulations to prevent pollution and contamination in their neighborhoods. CalEPA's environmental justice policies and programs aim to integrate these and other environmental justice considerations into the environmental regulatory activities, programs, and other actions of each of the Agency's boards and departments.

In 2013, CalEPA formed the Environmental Justice Enforcement and Compliance Working Group, later renamed the EJ Task Force. The EJ Task Force consists of regulatory agencies that implement and enforce environmental laws in California and it includes representatives from CalEPA and its boards and departments, and representatives of regional and federal agencies. The EJ Task Force identifies disadvantaged communities that suffer multiple pollution burdens and focuses enforcement and compliance efforts in those areas. There are two important components of the EJ Task Force's initiatives: multi-level government coordination of enforcement activity, and meaningful community consultation. Multi-level government coordination allows the EJ Task Force to address environmental problems in a comprehensive manner. Meaningful community consultation is the process of working closely with community advocates and residents who live in the focus area. The consultation process to better understand challenges the residents experience on a daily basis. The Imperial County Enforcement Initiative is the EJ Task Force's fifth multi-agency enforcement and compliance initiative. The EJ Task Force has conducted previous initiatives in Fresno, East Los Angeles, Oakland, and Pomona.[1]

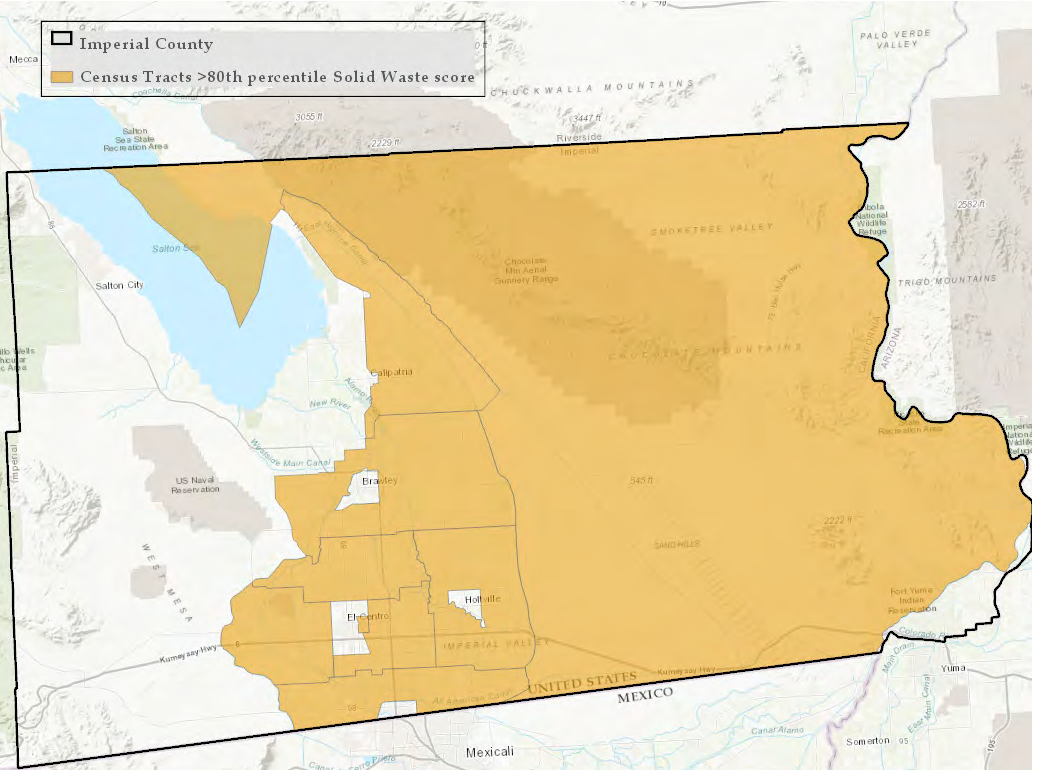
Community Focus

Imperial County is currently designated by the US Environmental Protection Agency as not being in attainment with health protective national air quality standards (known as, "NAAQS") for fine particulates and ozone forming pollutants that contribute to climate change and local health burdens. , and is designated as an area that is in serious nonattainment for larger particulates, PM 10, caused by things like dust and smoke, which can also lead to acute health impacts. Some of the sources of air pollution that drive these nonattainment designations in the region originate from agricultural land uses including tilling soil, agricultural burning, and diesel equipment used for farm operations. Additionally, truck traffic on unpaved roads, industrial processes, construction and demolition activities, off-highway recreational vehicle riding, and other air emissions, including generated from the Mexican side of the border all contribute to these nonattainment statuses.

CalEPA's statewide screening tool, CalEnviroScreen 3.0 indicates that much of the county falls within the top 80th to 95th percentile of all areas in California for pesticide applications. Studies have found that people living in agricultural areas of California have higher amounts of pesticides in their bodies than other people, so efforts to ensure the safe application and use of pesticides are therefore critical to protecting public health in these areas.

Much of the county also falls between the 80th to 95th percentile of Census tracts where residents live in close proximity to solid waste facilities, which are places where household garbage and other

1 CalEnviroScreen 3.0.
For more information, visit: *oehha.ca.gov/calenviroscreen*.



Census tracts in Imperial County above the 80th percentile for proximity to solid waste sites and facilities.

types of waste are collected, processed, or stored. Imperial County is also in the 80th to 95th percentile for proximity to businesses that generate hazardous waste, with associated risks to human health if the waste is not handled and disposed of properly.

Finally, the area near the border in the City of Calexico is near the 90th percentile for traffic density, due to cross-border traffic. Heavy duty diesel trucks not in compliance with California emissions standards can greatly increase levels of air pollution, with harmful health effects to county residents, many of whom have health conditions that may be exacerbated by exposure to pollution.

Health Concerns

California Department of Public Health data from 2015 indicates that Imperial County has 12,000 children diagnosed with asthma, and more than double the state's general rate of asthma-related emergency room visits and hospitalizations for children. In addition, Imperial County ranks in the 90th percentile of California for incidence of cardiovascular disease. Air pollution is not only a contributor to the development of asthma and cardiovascular disease, but can also be a trigger for asthma attacks and heart attacks. In addition, Imperial County is an area of California with a high poverty rate and a high percentage of linguistically isolated residents. These factors contribute to increased vulnerability of residents to the harmful health effects of pollution, and were factors in the EJ Task Force's decision to perform focused environmental enforcement, compliance, and investigative work in Imperial County. A final factor in the selection of Imperial County was that many of the key features of the EJ Task Force initiatives originated in a model for community-based environmental monitoring developed by Comite Civico Del Valle, Inc. (CCV). CCV is an Imperial County nonprofit organization that was founded in 1987 with the goal of improving the lives of disadvantaged residents through advocacy, civic education, organizing, and research.

Community Consultation & Priorities

In February of 2018, at the outset of the Imperial EJ Initiative, EJ Task Force members met with residents and local community leaders at a meeting facilitated by CCV to learn about community concerns. A few of the many areas of concern identified by community members were:

- Emissions generated from agricultural burning of excess vegetative materials associated with commercial growing and harvesting of crops;
- Fugitive windblown dust from unpaved roads and surfaces, especially related to truck traffic and off-road recreational vehicular activities;

- The potential contamination of water in open channels being delivered to residents for non-potable use;
- The timing and level of response to reports of illegal pesticide applications, including spray drift of pesticides onto people and non-agricultural property;
- Abuses of fieldworker rights, including excessive hours, poor working and sanitation conditions, lack of personal protective equipment, as well as threats and acts of retaliation.
- Proximity of a cleanup site of an old fertilizer producing facility to residences.

After this initial community engagement, EJ Task Force leaders met with local regulatory agencies to discuss what actions could be taken during the Initiative to respond to local concerns. One meeting was with the County Board of Supervisors, where members of the Task Force shared information about the Initiative and its goals. After that meeting, a Board of Supervisors member shared the information with a local newspaper. Following a news article announcing the inspections, CCV's leadership expressed frustration and concern that announcement of the inspections provided an opportunity for businesses to clean up or hide elements of their operations in anticipation of the inspections. Based on those concerns, CCV decided to withdraw their participation in the Initiative. The EJ Task Force nevertheless moved forward with planned inspections in an effort to address issues identified in the early community consultation.

The enforcement and compliance work that was performed during the Initiative is summarized in this report.

Air

The California Air Resources Board (CARB) regulates mobile sources of air pollution, including heavy-duty vehicles that emit greenhouse gases (GHGs), which contribute to climate change. CARB also certifies new vehicles, engines, and parts to reduce the public's exposure to localized air pollution impacts. California's 35 local air districts regulate air pollution from stationary sources, such as refineries, metal recycling facilities, and other industrial facilities. CARB provides oversight of the air districts and works collaboratively with the local air districts like the Imperial County Air Pollution Control District (ICAPCD) to ensure local enforcement programs are effective.

CARB Inspection Activity in Imperial County

Diesel particulate matter has significant health impacts associated with emissions from diesel vehicles, including premature death, cancer risk, respiratory illnesses, and increased risk of heart disease. In response to community concerns about local sources of air pollution such as heavy-duty diesel truck traffic, CARB inspected a total of 61 trucks at multiple locations throughout Imperial County and issued 13 citations for idling, inadequate emission controls in the vehicles, tampering, and failure to have an engine emission control label, which certifies the truck is equipped with an engine that meet U.S. emission standards.

This table summarizes the truck inspections and the related citations for violations.

Heavy-Duty Truck Inspections Violations	Total
Truck and Bus Emission Control Violations	6
Refrigeration Unit Violations	4
Tampering Violation	1
Tractor-Trailer Greenhouse Gas Violation	1
Idling Violation	1
Total Inspections	**61**
Total Citations	**13**

In addition, CARB conducted on-site fleet inspections at 35 facilities in order to determine compliance with the following diesel rules and regulations: the Emission Control Label (ECL) Program, the Periodic Smoke Inspection Program (PSIP), the Truck and Bus

(TB) Regulation, the Transport Refrigeration Unit Air Toxic Control Measure (TRU), and the In-Use Off-Road Diesel-Fueled Fleets Regulation (ORE). Based on these inspections, CARB initiated seven case investigations resulting in the collection of $90,000 in penalties and bringing all seven companies back into compliance for violations of air quality regulations. Six of the companies investigated were determined to be out of compliance with the TB Regulation and one company that was determined to be out of compliance with the TB Regulation and the TRU Air Toxic Control Measure. CARB inspected another 33 facilities for compliance with its Stationary Source, Refrigerant Management Program. High-global warming potential (GWP) refrigerants such as chlorofluorocarbons (CFC), hydrochlorofluorocarbons (HCFC), hydrofluorocarbons (HFC), and perfluorocarbons (PFC), are used in a large variety of refrigeration and air-conditioning systems, and inspections were conducted to ensure businesses were not emitting unregulated emissions that contribute to climate change. CARB identified six businesses with violations and is working to bring them into compliance with the regulation.

Imperial County Air Pollution Control District Inspection Summary

The Imperial County Air Pollution Control District (ICAPCD) regulates stationary sources of air pollution within Imperial County. ICAPCD inspects facilities to ensure compliance with air quality regulations and responds to complaints about air pollution from the public.

ICAPCD, in cooperation with CARB, inspected six geothermal power plants and one municipal solid waste landfill. The geothermal power plants were prioritized for inspection in part because of community concerns about the plants. No violations were identified during the inspections. However, subsequent to the inspections, ICAPCD issued three notices of violations (NOV) to CalEnergy Corporation for violations identified as a result of earlier ICAPCD investigations. Two of the NOVs were issued because CalEnergy operated its Elmore and Region 1 geothermal plants for seven years without obtaining

SPOTLIGHT

Off-Road Vehicle Enforcement

The Imperial County Air Pollution Control District (ICAPCD) convened meetings over the course of the Initiative to bring together federal, state, and county regulatory agencies to discuss how better coordination could reduce incidents of illegal off-road vehicle activities. Imperial County had over 800,000 recreational off-road vehicle riders on federal and state lands in 2018. Riders who enter prohibited areas can disturb the desert crust, which increases the levels of windblown dust – PM 10 – that is known to contribute to asthma problems. Imperial County is working with CARB, the California State Lands Commission, and the US Bureau of Land Management to determine the impact of off-road vehicle riding in certain high risk areas and identify best practices to reduce PM 10 levels resulting from off-road riding activity.

Additionally, as a result of the EJ Task Force's coordination efforts, the Imperial County Sheriff's Office sought and received grant funds from the CalEPA Environmental Enforcement and Training Account Grant Program to increase off-road vehicle enforcement around sensitive areas such as the Salton Sea during times of high off-road vehicle activity and to provide rider education about the adverse health effects to county residents from prohibited riding activity.

Local, state, and federal government staff meeting to coordinate strategies to reduce illegal off-road vehicle riding activity

federally-enforceable operating permits from ICAPCD and the U.S. Environmental Protection Agency (U.S. EPA). The third NOV was issued because CalEnergy failed to adhere to a condition of a variance related to a breakdown of a heat exchanger at its Elmore power plant. No excess emissions were associated with the violations at the CalEnergy plants.

Federal law requires major sources of air pollution to obtain operating permits that can be enforced by U.S. EPA. In Imperial County, both U.S. EPA and ICAPCD can enforce federal permitting regulations. ICAPCD assessed an $180,000 penalty against CalEnergy for its operations without the required permits. These penalty dollars were designated by the air district to fund the instillation of an indoor air filtration system in the Grace Smith Elementary school in Niland,at which 16% of the students have asthma—nearly double the national average. CalEnergy has also made a commitment to invest more than $500,000 to install lower emitting equipment to resolve the violations and ensure emissions remain below the federal permitting threshold at its facilities.

Auto Dismantling

The State of California is actively confronting the problem of unlicensed vehicle dismantling. former Governor Brown signed Assembly Bill 1858 in September 2016, requiring the Department of Motor Vehicles (DMV) to collaborate with representatives from six state agencies on enforcement and compliance activity related to unlicensed and unregulated automobile dismantling, including tax evasion, adverse environmental impacts, and public health impacts. The collaborating agencies are: the California Department of Tax and Fee Administration (CDTFA), CalEPA, the Department of Toxic Substances Control, the State Water Resources Control Board, the California Air Resources Board and CalRecycle. The DMV established the Vehicle Dismantler Industry Strike Team (VDIST) with the collaborating agencies to identify unlicensed vehicle dismantlers and impose appropriate sanctions on those in violation of the law.

Unlicensed auto dismantling was a specific focus area of the Imperial County EJ Initiative based on concerns expressed by community members and local government over the number of areas in residential communities where potential illegal auto dismantling activity has been taking place. It is unlawful for any person to act as an automobile dismantler without having an established place of business, meeting specified requirements, and having a current, valid license or temporary permit issued by the DMV.

Unlicensed vehicle dismantling often occurs in private garages, empty lots, industrial areas, residential neighborhoods, and near parks, schools, and vulnerable waterways, such as storm drains. Individuals who dismantle vehicles without proper permits typically do not properly dispose of hazardous chemicals such as anti-freeze, engine oil and transmission and radiator fluids. This hazardous waste ends up contaminating soil, rivers and streams, and can infiltrate groundwater and become a threat to the public's drinking water. Additionally, businesses operating without proper licensing gain an unfair advantage over their competitors who pay for permits and implement required environmental and safety practices.

Transmission fluid spilled onto ground from poor auto maintenance practices at an illegal auto dismantling site.

To respond to concerns about unlawful auto dismantling in Imperial County, the DMV coordinated over 12 inspections. DMV investigators were joined by inspectors from the Air Resources Board, Cal Recycle, the Department of Toxic Substances Control's Office of Criminal Investigations, and the Imperial County Sherriff's Office.

The auto dismantling inspections resulted in thirteen citations:

- Five misdemeanor citations for unlicensed dismantling activities;
- Two misdemeanor citations for unlicensed auto repair activities;
- Six businesses were cited for violations related to hazardous waste management.

During the inspections, neighboring businesses with proper licenses expressed appreciation to inspectors for their work, as they expressed frustration from unfair competition from unlicensed businesses. Randy Vera, area commander for the DMV's strike team, explained, "this work is about providing a fair playing field, and we were happy that the businesses that are following the rules and taking steps to do things the right way were appreciative of our work."

Enforcement action was taken against an auto repair business that was illegally disposing of hazardous waste down a storm drain.

Hazardous Waste

The Department of Toxic Substances Control (DTSC) enforces laws and regulations that apply to the generation, handling, treatment, and disposal of hazardous waste in California. DTSC regularly inspects hazardous waste treatment, disposal and storage facilities (TSDF), used oil recycling handlers, large quantity hazardous waste generators, and electronic waste facilities.

In Imperial County, DTSC acts as the local regulatory agency, or CUPA, which means it is responsible for inspections and enforcement in any of the six unified program regulatory programs. These six programs are:

- Hazardous Waste Generator and Tiered Permitting Program;
- Hazardous Materials Release Response Plans and Inventory Program;
- Hazardous Materials Business Plan;
- California Accidental Release Prevention Program;
- Aboveground Petroleum Storage Act; and
- Underground Storage Tank program.

Three DTSC units participated in the Initiative: the Cypress/San Diego Enforcement Branch, the Office of Criminal Investigations (OCI), and the Imperial Certified Unified Program Agency (CUPA). The facility inspections were prioritized based on the type of industry, inspection history (or lack of inspection history), and input from the local government.

A summary of actions conducted by the three DTSC units are below:

DTSC's Cypress/San Diego Enforcement Branch conducted inspections of five regulated facilities including one permitted hazardous waste facility, two Universal Waste/E-Waste facilities, and two hazardous waste transporters. One of the Universal Waste/E-waste facilities had gone out of business and that information was used to update DTSC's databases. The other e-waste facility inspection did not result in identification of any violations. The two transporter inspections also did not identify violations. The Clean Harbors Westmoreland landfill (a permitted hazardous waste facility) was inspected and no violations were observed.

Enforcement action was taken against this facility by the CUPA for, among other violations, ponding oil on the ground from washing of the company's truck.

The DTSC Imperial CUPA (CUPA) conducted 26 inspections, two truck stops, and participated in joint inspections with OCI, DMV, and other agencies at automobile dismantling facilities. The CUPA worked with five of the auto dismantling facilities and returned them back to compliance with Unified Program requirements. Of the 26 inspections, the CUPA found 16 facilities with violations. Formal enforcement actions were or are being taken against three facilities:

- Enforcement against one of the three facilities is complete. There were multiple hazardous waste violations at a direct transfer station (which was also cited for violations by the Local Enforcement Agency, discussed in the Solid Waste section), which included the discharge of hazardous waste on the property. The facility has since returned to compliance. A Consent Order was signed, with a total settlement of $17,544, half of which will go towards a Supplemental Environmental Project (SEP) for hazardous waste cleanup efforts in Imperial County.
- Enforcement is underway against another a facility with multiple violations, including open containers, missing manifests (a manifest is the shipping document that travels with hazardous waste from the point of generation, through transportation, to the final treatment, storage, and disposal facility), failure to properly classify waste, lack of required plans, including a Hazardous Materials Business Plan, a Spill Prevention Control and Countermeasures Plan, and failure to submit the annual tank facility statement. The CUPA has not concluded the enforcement process at the time of the publication of this report.
- At another facility, OCI identified and referred to the CUPA a case of abandoned drums of hazardous waste at a closed gas station. The CUPA is investigating and enforcement action is pending.

DTSC's Office of Criminal Investigation organized and participated in two multi-agency and multi-jurisdictional transporter and facility inspections and enforcement activities.

Together with U.S. Customs and Border Protection (CBP) and other agencies, OCI conducted 127 inspections of transporters at the Calexico Port of Entry, resulting in 13 violations. The violations included interception of an individual traveling into the U.S. with 12 pounds of an illegal unregistered pesticide that was allegedly going to be applied in Imperial County. The pesticide was labeled "Fumetico 56," and is an aluminium phosphide, a highly toxic pesticide, that is not registered for use in California.

DTSC OCI staff inspecting transporters at the Calexico Port of Entry.

Pesticides & Produce

The Department of Pesticide Regulation (DPR) oversees and enforces federal and state laws covering pesticide registration, licensing, the sale and use of pesticides, and worker protection. Additionally, DPR administers the nation's largest monitoring program for analyzing domestic and imported produce for pesticide residues. To implement these food safety programs, DPR conducts three types of inspections: the collection and testing of produce for illegal pesticide residues; marketplace surveillance to verify only registered and properly-labeled pesticides are sold; and producer establishment inspections of pesticide manufacturers to ensure the pesticides at those facilities are properly manufactured, registered and labeled.

DPR works closely with county agricultural commissioners (CACs), who have the primary responsibility to enforce laws and regulations pertaining to pesticide use. In Imperial County, the Agricultural Commissioner's staff conduct inspections to ensure compliance with pesticide use requirements, investigate pesticide incidents, and take administrative actions against violators.

DPR Pesticide Market Surveillance Inspections

DPR conducted marketplace surveillance inspections at ten retail locations. Three product registration violations were observed during the inspections. In each case, the products at each retail location were ordered to be removed from sale.

DPR Pesticide Product Sampling

DPR conducted two Pesticide Produce Establishment inspections where pesticides are manufactured, processed and packaged or re-packaged. As a result of the inspections, two pesticide samples were collected for analysis of ingredients. The samples included a bird repellent and an insecticide. One insecticide product was found to be over-formulated, meaning the active ingredient detected was higher than what the product label stated. In each case, the products at each retail location were ordered to be removed from sale.

DPR Food Safety Inspections

DPR conducted food safety surveillance inspections at 25 retail locations in Imperial County and 13 wholesaler/distribution centers in the Southern California area. A total of one hundred and forty food samples were collected. Four violations were detected during these inspections. The commodities with illegal pesticide residue were: two samples of limes grown in Mexico; one sample of guava grown in Mexico; and, one sample of cilantro grown in the U.S. DPR notified the wholesalers of the product violations, and they turned over the commodities to be disposed of including seventeen cases of guavas, two cases of limes and one case of cilantro. Additionally, for the investigation involving illegal pesticide residues on cilantro, a California grower in Ventura voluntarily disked – or "chopped up" the cilantro crop – in the field where it had been harvested.

Imperial County Agricultural Commissioner Pesticide Use Inspections

For the Initiative, the Imperial County Agricultural Commissioner's Pesticide Use Enforcement Division performed various types of routine and focus inspections throughout the county. The focus included: pesticide applications near schools and residential areas, pesticide incidents and drifts in the county, the types of pesticides used in Imperial County and their toxicities, and worker safety for fieldworkers and pesticide handlers. CAC staff conducted one hundred-nine use inspections during the Initiative, which are summarized in the following table.

	Inspection Type	Inspections	Inspections with Violations	Description of Inspection
Agricultural Use Inspections	Field Worker Safety	15	2	Crews of fieldworkers were interviewed to determine whether various worker protection standards are met regarding pesticide safety.
	Pesticide Use Monitoring	15	4	Pesticide applications were monitored to determine compliance with permitting, pesticide labeling, training, worker safety, and other requirements to mitigate hazards.
	Commodity Fumigation Monitoring	1	0	A pesticide fumigation applications of various post-harvest agricultural commodities was monitored to determine compliance with permitting, pesticide labelling, training, worker safety, and other requirements to mitigate hazards.
Structural Use Inspections	Structural [Fumigation] Monitoring	1	0	A structural fumigation application was monitored to determine compliance with pesticide labelling, training, worker safety, and other requirements to mitigate hazards.
	Structural [General Household] Monitoring	5	0	Structural applications for general household pests were monitored to determine compliance with pesticide labelling, training, worker safety, and other requirements to mitigate hazards.
Headquarters Inspections	Pest Control Headquarters	56	13	The records of farms that apply pesticides were reviewed to determine compliance with worker safety requirements; including training records, and medical supervision and respiratory program records for applicable pesticide handlers.
	Pest Control Business Headquarters	16	3	The records of persons/firms that apply, sell, or recommend pesticides for hire were reviewed to determine compliance with worker safety requirements; including training records, and medical supervision and respiratory program records for applicable pesticide handlers.
	Totals	**109**	**22**	

CAC Agricultural Use Inspections

CAC inspectors increased surveillance in areas near schools, residential areas, and locations where use of restricted use pesticides was proposed. Additionally, CAC delegated additional resources for these inspections during April 2018. Six of the thirty-one inspections found non-compliant activity. These included one instance of an application performed under windy conditions that could have resulted in pesticide drift, as well as, pesticide handler personal protective equipment violations and violations regarding hazard communication for fieldworkers and pesticide handlers. All of the violations were corrected, either at the time of the violation or with a follow up inspection. One violation resulted in a citation.

CAC Headquarters Inspections

Annual headquarters inspections are scheduled to be performed in the late spring of each year. This schedule is based on agricultural and pesticide use trends in Imperial County. In addition to conducting their annual inspections, CAC staff also conducted follow up inspections to ascertain the magnitude of the violations identified in the field.

Sixteen of the seventy-two inspections found non-compliant activity. Six were violations of the Respiratory Protection Program, which requires that employees required to use a respirator are provided with proper training, guidelines for use, medical evaluation, and fit testing to protect against respiratory hazards caused by certain pesticides. Additional non-compliant activity was in pesticide handler training, medical supervision for employees handling certain pesticides known to inhibit cholinesterase (an important nervous system enzyme), hazard communication to fieldworkers and pesticide handlers, and various paperwork violations of regulations not related to safety. All of these violations were corrected. Nine resulted in citations.

CAC Structural Use Inspections

The Imperial County Agricultural Commissioner staff conducts structural pesticide application inspections to ensure applicators and the public are not harmed by applications that occur in homes or businesses. One structural fumigation application inspection was conducted and five general household application inspections were conducted. No violations were noted.

DPR staff inspecting a local market to ensure products meet registration and labeling requirements.

SPOTLIGHT

Department of Pesticide Regulation and Imperial County Agricultural Commissioner Office Outreach Workshops

DPR and EDD staff teach Integrated Pest Management strategies to child care providers in Imperial County.

Child Care Providers Trainings - El Centro

Another goal for the initiative was to better engage the community on pesticide safety issues and reach out to various groups that were identified as being of concern, especially fieldworkers. As a result, DPR has developed a written pesticide safety training for fieldworkers and partnered with the Employment Development Department (EDD) to reach out to fieldworkers regarding pesticide safety issues. DPR delivered this safety training at EDD workshops in Imperial County, conducted outreach and training to farm labor contractors, and conducted pesticide use trainings to child care providers. Below is a brief summary of each of these efforts.

On April 26, 2018, DPR provided over 100 child care providers throughout Imperial County training in English and Spanish on Integrated Pest Management strategies to address many common pest problems. The purpose of this training was to suggest safer ways to reduce the application of pesticides and antimicrobial chemicals in and around areas where children play. Participants learned how to use pesticides, including disinfectants, safely and effectively in child care settings.

Field Worker Trainings - Calexico

On May 25 and July 27, 2018, the Employment Development Department (EDD) and the Imperial County Agricultural Commissioner staff teamed up to conduct two Field Worker Safety Training sessions using curriculum developed by DPR. These sessions informed fieldworkers of their rights, how to report illegal activities, and important steps on how to protect themselves and their families from pesticide exposure – including proper steps to decontaminate clothes after work in fields where pesticides have been applied. The trainings took place at EDDs One Stop office, where many fieldworkers gather after crossing the Mexicali border.

Promotores Training - El Centro

On June 11, 2018, the Imperial County Office of Education hosted a one-day Train-the-Trainer for Promotores – which is the Spanish term for "community health workers". The Hispanic community recognizes promotores de salud as lay health workers who work in Spanish-speaking communities. DPR arranged to provide the training—which was developed by the Center for Environmental Research and Children's Health at UC Berkeley---in Imperial County as part of the EJ Task Force efforts. The Center presented research to demonstrate the health effects from pesticide exposures, trained promotores on DPR's regulations that protect the rights and safety of farmworkers, and also outlined best practices to keep farmworkers from tracking pesticides back into the home after work.

Farm Labor Contractor Training - Imperial

On July 12, 2018, the Imperial County Agricultural Commissioner's Office invited CalOSHA and DPR to a multi-agency workshop for farm labor contractors to offer regulatory compliance assistance to promote field worker safety. This training underscored the importance of taking steps to prevent workplace accidents through proper training and procedures, personal protective equipment, and accessible shade structures to prevent heat related illness.

Solid Waste

CalRecycle is the state's solid waste management and recycling agency. CalRecycle works with local tire and solid waste enforcement agencies to ensure compliance with its regulations. In Imperial, the Imperial County Department of Environmental Health is the local enforcement agency (LEA) and the tire enforcement agency.

CalRecycle and the Imperial County Department of Environmental Health conducted inspections at three types of facilities: solid waste facilities, beverage container recycling facilities, and facilities that generate, haul or utilize used tires. For solid waste facilities, such as landfills, transfer stations, and composting sites, CalRecycle ensures that these businesses meet state standards for environmental protection, public health and safety. The County Local Enforcement Agency has the authority to inspect, permit, and enforce state solid waste facility requirements.

CalRecycle administers and evaluates compliance with the beverage container recycling program and the waste tire enforcement program. Within the beverage container recycling program, people visit recycling centers to exchange their empty bottles and cans that have a California Redemption Value (CRV) for cash. The recycling centers pay back what the people originally paid as a CRV fee when they purchased the beverages. Inspections are conducted at beverage recycling centers to ensure the centers are not purchasing materials that have no refund value and to ensure that the centers properly pay for the materials that do have a refund value.

Within the waste tire enforcement program, inspections are conducted to ensure that the reusable and waste tires generated in the state are safely transported, stored, processed for recycling or disposed of in a manner to protect public health and safety and the environment. CalRecycle conducts regular, unannounced inspections of waste tire generators, haulers, and end-use facilities.

Solid Waste Facility Inspection Summary

CalRecycle and the Imperial County LEA conducted seven inspections. These included one solid waste landfill, four transfer/processing facilities, one closed illegal dumpsite, and a composting operation.

There were 11 regulatory violations at the seven facilities. Of the facilities that were inspected, a transfer station and direct transfer station operators received the most violations and were the primary source of concerns. Both received citations for leaking roll-off trailers and for maggots on-site. Records indicate that these issues continue and ongoing violations are being noted by the LEA. The transfer station operator received a citation for maintaining incorrect tonnage

During the inspection of a waste transfer station, maggots were found underneath the leaking trash hauling trailers.

records, which track how much material is sent to the landfill. In response to the citation, the operator revised the facility plan to more accurately record and report tonnages. The most recent LEA inspection report received by CalRecycle indicates that the facility is now complying with this requirement. CalRecycle is continuing to review LEA inspections records to track compliance for the two sites.

Beverage Container Inspection Summary

CalRecycle visited sixteen recycling centers in Imperial County as part of the Initiative. Businesses were issued a notice of noncompliance, warning letter, or notice of violation and fine, depending on violation's noted by the inspectors. Eleven of the sixteen recycling centers sites were in compliance with regulatory requirements. Four were found to be non-compliant, and one was issued a notice of violation and fine of $100.

Waste Tire Inspection Summary

California generates more than 40 million reusable and waste tires each year. CalRecycle's waste tire program is dedicated to finding new uses for this valuable resource, which range from reuse to retreading to uses in secondary products and engineered applications to energy conversion. CalRecycle's waste tire enforcement program seeks to ensure that the reusable and waste tires that are generated every year in the state are safely transported, stored, processed for recycling or disposed of in a manner to protect public health and safety and the environment.

CalRecycle staff meet with leaders from Slab City to determine the most effective process for trash collection and removal.

SPOTLIGHT

Slab City Clean Up

Slab City is located in the Sonoran Desert in Imperial County. The Slab City property is state property that is administered by the California State Lands Commission. The land was used as a U.S. Marine Corps base during World War II. Over time, individuals began establishing residences on the abandoned slabs left when the base was decommissioned and reverted to state ownership. During the Initiative, the Imperial County Department of Environmental Health brought to the attention of the EJ Task Force the solid waste concern in Slab City. Slab City residents do not pay property fees for public services, and therefore do not have solid waste collection services.

CalRecycle is currently working with the Imperial County Department of Environmental Health, Slab City residents, and the State Lands Commission to conduct a Pilot Community Cleanup Day at Slab City, where residents and itinerant campers or "snowbirds" can voluntarily bring trash, other waste, and recyclables to designated areas throughout Slab City to be collected by a CalRecycle contractor. The first community meeting to organize a Pilot Community Cleanup Day was held on September 19, 2018. Slab City residents helped map locations for drop-off sites, discussed types of waste materials at Slab city, and provided input on the logistics for the cleanup day. A second organizing meeting will be held in February 2019, followed by the cleanup day. At the conclusion of the pilot, a report will be shared with the County, Slab City residents, and the State Lands Commission to assist in development of a longer-term waste management solution.

CalRecycle accomplishes this by conducting regular, unannounced inspections of more than 30,000 waste tire generators, haulers, and end-use facilities. The Department of Environmental Health carries out CalRecycle's waste tire program in Imperial County. When a facility does not correct violations found by the Department within the timeframe allowed, the facility to CalRecycle for escalated enforcement, including the imposition of administrative penalties. The Department together with CalRecycle conducted ten waste tire inspections in Imperial County during the initiative. Two sites were out of compliance with waste tire regulations and five sites received notices of violations of regulatory requirements. The sites with violations were re-inspected within 30 days to confirm that actions had been taken to correct violations.

Water

The Colorado River Basin Regional Water Quality Control Board (Regional Water Board) is responsible for protecting ground and surface water quality in Imperial County by ensuring compliance with water quality laws, regulations, policies, and plans. State Water Resources Control Board (State Water Board) staff worked closely with the Regional Water Board staff to inspect facilities for compliance with the Federal Clean Water Act and the California Porter-Cologne Water Quality Control Act. In total, 13 facilities were inspected during the Initiative. Based on analysis of community concerns, records of previous compliance issues, and site-visit history, inspections were focused on industrial facilities, wastewater treatment plants, and concentrated cattle feed lots.

Industrial facilities, regulated under the Statewide Storm Water Industrial General Permit (IGP), can contribute to surface water pollution when contaminants such as oil, grease, toxic metals, and sediment are carried offsite in storm water either directly to, or through storm drains, to streams and rivers. Seven industrial facilities were inspected for storm water compliance as part of the Initiative, including an auto dismantler, transportation facilities, chemical mixing and distribution facilities, and a power plant. Common areas of concern identified during the inspections included general housekeeping related to materials, waste and chemical storage, leak prevention, and recordkeeping. The Regional Water Board issued two Notices of Violation based on the inspections conducted during the Initiative.

Wastewater treatment plants typically treat wastewater from homes, businesses, and industrial facilities which is then discharged into the environment. Inspections of three waste water treatment plants, permitted and regulated under individual National Pollutant Discharge Elimination System (NPDES) permits, included assessing the physical conditions of the facility's current treatment processes and operations, evaluating the plants' operation and maintenance activities, and determining whether the treatment plants are meeting their required discharge standards. One inspected facility was found to have substandard maintenance operations and sludge storage practices, and inadequate standard operating procedures. The treatment plant was made aware of the concerns and the need for corrective action.

Two cattle feedlots with coverage under the General NPDES Permit for Concentrated Animal Feeding Operations (CAFOs) were inspected in Imperial County. CAFOs are facilities where animals have been, are or will be stabled or confined and fed for a total of 45 days or more in any 12-month period. In November of 2018, a Notice of Violation was issued to one CAFO for inadequate recordkeeping, poor pond

Water board inspector at composting facility.

maintenance, and failure to contain non-storm water runoff. . The State and Regional Water Boards also inspected one beef processing facility, covered under an individual Waste Discharge Requirement (WDR) permit. No major water quality concerns were identified during the inspection.

Conclusion

One of the purposes of the EJ Task Force is to provide staff across CalEPA's boards and departments with a greater understanding of the environmental challenges faced by our most overburdened communities. Without such an understanding, the state cannot be sure that its environmental compliance and enforcement programs are properly designed and focused.

The Imperial County EJ Initiative presented new challenges and opportunities not encountered in previous EJ Task Force efforts because it was the first initiative to take place in a rural setting, and with a county-wide emphasis. As a result, the compliance activities of the Initiative presented a wide range of new issues and problems. For example, in contrast to the initiatives undertaken in urban settings, the Task Force conducted inspections at feedlots and geothermal power plants, and addressed illegal off-road vehicle activity, farm worker protection, and cross-border pollution issues.

In addition, this was the first initiative where the Task Force encountered open antagonism from County officials to efforts from the regulatory agencies to achieve compliance. While the EJ Task Force typically holds workshops and community meetings to discuss environmental issues, its enforcement activities, including inspections, are usually, by necessity, unannounced so it can get an accurate snapshot of compliance in the community. The Imperial County Initiative was the first Initiative where the Task Force's inspections were announced publicly by a local official in a local newspaper. Although, as this report indicates, a number of violations were still observed during the Initiative, it is possible others were addressed or hidden from regulators as a result of this public announcement. And unfortunately, a level of trust between the Task Force's community partners and regulators was lost in the process.

Overall, the Task Force gained valuable experience from the Imperial County Initiative. In addition to its enforcement work, the Task Force identified gaps in regulatory activity, which highlight the need to continue to work with local community partners and regulatory agencies, to prevent pollution and increase compliance across the County.

As it does throughout the State, CalEPA will continue to monitor and encourage compliance in the County, and is committed to improving health and safety outcomes for County residents. CalEPA will also continue to support local efforts to update regulations, support community cleanup efforts, and conduct activities to monitor and enforce against illegal activity. Finally, CalEPA's boards and departments have other initiatives and efforts underway in Imperial County, and the lessons learned from the EJ Task Force's work provide important insights that can inform those, and other efforts in similar rural areas and border communities.

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Latinx and Indigenous Mexican Caregivers' Perspectives of the Salton Sea Environment on Children's Asthma, Respiratory Health, and Co-Presenting Health Conditions

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Abstract: This research investigated Latinx and Indigenous Mexican caregivers' perspectives of the Salton Sea's environment (e.g., dust concentrations and other toxins) on child health conditions. The Salton Sea is a highly saline drying lakebed located in the Inland Southern California desert borderland region and is surrounded by agricultural fields. Children of Latinx and Indigenous Mexican immigrant families are especially vulnerable to the Salton Sea's environmental impact on chronic health conditions due to their proximity to the Salton Sea and structural vulnerability. From September 2020 to February 2021, we conducted semi-structured interviews and focus groups with a total of 36 Latinx and Indigenous Mexican caregivers of children with asthma or respiratory distress living along the Salton Sea. A community investigator trained in qualitative research conducted interviews in Spanish or Purépecha, an indigenous language spoken by immigrants from Michoacán, Mexico. Template and matrix analysis was used to identify themes and patterns across interviews and focus groups. Participants characterized the Salton Sea's environment as toxic, marked by exposure to sulfuric smells, dust storms, chemicals, and fires, all of which contribute to children's chronic health conditions (e.g., respiratory illnesses such as asthma, bronchitis, and pneumonia, co-presenting with allergies and nosebleeds). The findings have important environmental public health significance for structurally vulnerable child populations in the United States and globally.

Keywords: asthma; child health; respiratory conditions; environmental health; Indigenous Mexicans; Latinx health; Purépecha; Salton Sea

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1. Introduction

Asthma is the most common chronic condition among children in the United States (US), with ~11.3% of the US child population estimated to suffer from asthma) [1]. Yet, children's risk for asthma varies depending on social status (e.g., race/ethnicity, indigeneity, citizenship), economic factors, and environmental exposures. Childhood asthma rates are highest among racial/ethnic minority children [2], who are often from low-income families living in poor neighborhoods near busy highways and industrial zones [3,4]. Low-income and racial/ethnic minority children, when compared to middle-class white children, experience a lower quality of life due to higher exposure to environmental hazards [5,6]. While geography matters, children in both rural and urban communities are exposed to harmful environmental hazards. For instance, particulates from neighborhoods in urban settings are often from fossil fuels emitted through sources such as congested traffic and construction sites. Particulates from neighborhoods in rural settings are often from windblown dust from fields or unpaved roads and fossil fuels from agricultural equipment.

Studies have shown that racial/ethnic minority children, including Black/African American, Latinx/Hispanic, and first- and second-generation immigrant children, are disproportionally exposed to particulate matter (solids or liquids in the air) with diameters of 2.5 microns or less ($PM_{2.5}$) which include smoke from fires and emissions from industrial facilities among other sources [3,7]. Fine particles are especially dangerous because their small size can more easily enter children's lungs and potentially the bloodstream, contributing to poor health outcomes [8].

Structural and social determinants of health (SDOH) play a critical role in children's risk for asthma and related respiratory health conditions. SDOH, the conditions into which individuals are born, grow up, live, work, and age, act as key determinants of health. They determine access to education, quality housing, and safe neighborhoods, as well as exposure to environmental hazards such as poor air quality [9]. Yet, we also know that historical processes of colonialism, classism, and racism have historically set up inequities within institutions and social life, patterning the distribution of SDOH in minoritized populations and contributing to health inequities [10]. As Brewer and colleagues argue, childhood asthma rates are the embodiment of environmental hazards, revealing the social pattern of inequity and the disadvantage of racial/ethnic minority children [11].

A unique example of the confluence of structural and SDOH on childhood asthma is among low-income Latinx and Indigenous Mexican children in communities bordering the Salton Sea in the desert region of Inland Southern California [12,13]. The prevalence of childhood asthma among children living along the southern part of the Salton Sea is 20–22.4% [14], double the state and national childhood asthma prevalence of 10% and 11.3%, respectively [1]. The air quality around the Salton is a significant local, regional, and statewide concern, and there are efforts to restore the ecosystem around the Salton Sea (e.g., 10-year Salton Sea plan) [15] and improve the region's air quality through resources and funds that align with the designation of an AB 617 community [16].

In this article, we build on our existing work on the working and living conditions that contribute to health disparities among the Latinx and Purépecha farm working communities along the northern part of the Salton Sea [12,17] and consider the impact of the Salton Sea environment on the health and wellbeing of children living along its borders. The funded project, Childhood Asthma and the Salton Sea, is part of a larger National Institute for Minority Health and Health Disparities-funded project focused on exposure to aerosolized environmental contaminants from the Salton Sea's drying lakebed. One important component of the study is the engagement of caregivers and key stakeholders in partnered public health research focused on understanding the impacts of the Salton Sea on children's respiratory health. This study uniquely focuses on caregivers' understanding of the Salton Sea's impact on the health of children diagnosed with asthma or chronic respiratory health problems through qualitative interviews and testimonials provided by Latinx and Indigenous Mexican caregivers of children with asthma and respiratory problems.

2. Methods

The complete study was carried out from fall 2019 to spring 2021. Qualitative interviews were conducted from September 2020 to February 2021. We used principles of community-based participatory research (CBPR) whereby decision-making was collaborative, knowledge was co-created, and resources were shared [18]. In line with CBPR approaches, at the start of the project, we convened a community advisory board (CAB) of 12 members representing parents of children with asthma, environmental justice organizations, healthcare systems, and community health workers (CHWs) or promotores de salud. The advisory board met quarterly to guide project activity. CAB members reviewed interview guides and recruitment material and provided input on recruitment, initial findings, and community dissemination strategies.

Prior to the start of the research, we obtained ethical approval from the University of California, Riverside Institutional Review Board. All participants provided electronic consent prior to the start of data collection.

2.1. Setting

Our study focused on childhood asthma among Latinx and Indigenous Mexican children in the rural desert region of Inland Southern California with a focus on the Eastern Coachella Valley which includes the unincorporated communities of Thermal, North Shore, Oasis, and Mecca (see Figure 1 for a map of the study region). These unincorporated communities do not have their own government structure and are characterized by poor housing and water infrastructure exposing residents to environmental hazards [13]. These communities reside on the northern part of the Salton Sea, a once booming resort area that swiftly changed to low-income housing for immigrant communities as the agricultural runoff, the main source of water, increased the lake's salinity contributing to disease and infection among the lake's habitat [19,20].

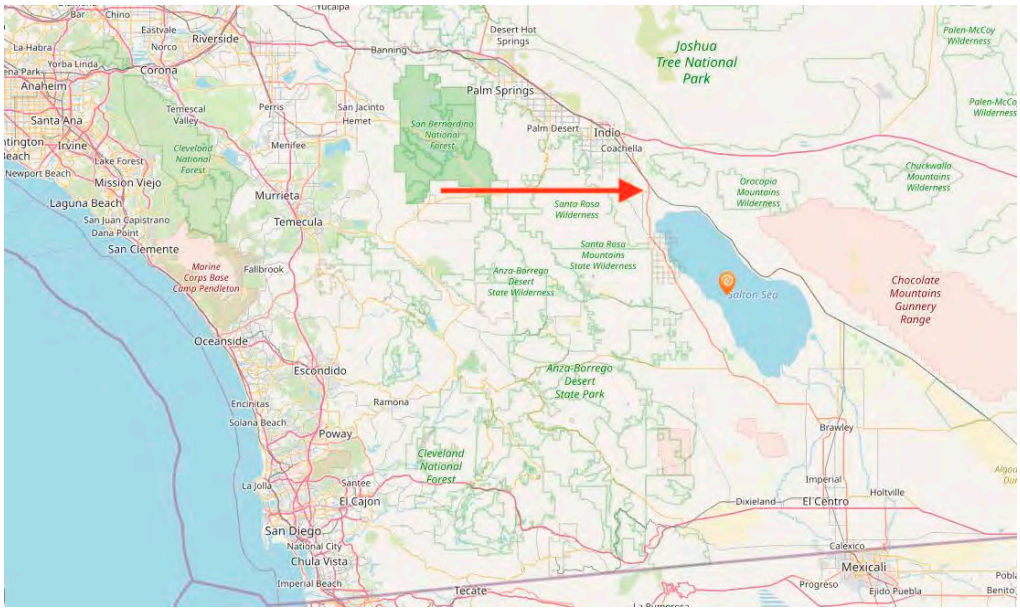

Figure 1. Study Setting along the Salton Sea and its Location in the US-Mexico Borderlands.

2.1.1. The Salton Sea

The Salton Sea occupies the prehistoric lakebed of Lake Cahuilla located in southeast California between Riverside and Imperial Counties and in the US-Mexico borderlands (approximately 90 miles from the US-Mexico border, see Figure 1). It came into being in the early 1900s due to an error with the rerouting of overflow from the Colorado River to the Imperial Valley. Once the overflow was controlled, the resulting lake was utilized for draining agricultural runoff from nearby farmlands, which has created a highly toxic body of water, further exacerbated by rising temperatures in the area [20] that have contributed to water evaporation, which exposes the sediment where the toxins (e.g., heavy metals, bacteria, and pesticides) rest. Water politics, involving the 2003 Color Riverside Agreement and recent negotiations by the Biden Administration, have significantly reduced water to the Imperial Valley and its agricultural lands, which was a significant source of water for the Salton Sea [21]. The result is a rapidly shrinking lake and exposed lakebed.

This environment has harmful effects on wildlife (fish and migrating birds) and on the human population around the Salton Sea [22]. Communities surrounding the Salton Sea have a higher incidence of respiratory distress, especially among children [23], compared to the general population [24]. Recent studies using environmental chamber models to

simulate the Salton Sea found that daily exposure to the Salton Sea's aerosols induced non-allergic inflammatory responses in animal models [25]. The activation of non-allergic inflammation genes upon chronic exposure to the lake's aerosols likely results in lung inflammation and affects the lung health of those living along its borders.

2.1.2. Structurally Vulnerable Populations Living along the Salton Sea

This region is home to a large Latinx and Indigenous Mexican immigrant farm working population that lives in low-income and poverty-stricken communities (median household income in Mecca, one of the communities at the northern part of the Salton Sea, is $25,202) [26] and works in the nearby agricultural fields. This population experiences significant disparities in health due to their structurally vulnerable positions and chronic daily exposure to stressors that compromise their physical and mental health [13]. We draw on the concept of structural vulnerability in the anthropological and social medicine literature to illustrate how positionality places Latinx and Indigenous Latin American farm-working populations in the US in precarious social positions within a hierarchical social order and power relations that expose them to structural violence. This term (i.e., structural violence) refers to a violence that is often invisible and plays out in seemingly ordinary ways (e.g., healthcare insurance requires documentation status) [27,28].

The adult population living along the Salton Sea's border is predominantly an immigrant, mono-lingual Spanish-speaking Latinx population born in Mexico that travelled to the region to work in the agricultural fields, whereas the majority of the child population was born in the US and is of Mexican heritage. Furthermore, among this population is one of the largest Purépecha communities in the US, an Indigenous group from the Mexican state of Michoacán. There are an estimated 6000 to 10,000 Purépecha-identifying individuals in this region of the desert and most are from Ocumicho. Many Purépecha are monolingual and speak their traditional language limiting their understanding of Spanish or English and excluding them from Salton Sea decision making [29]. As argued elsewhere, this Indigenous Mexican child population is especially vulnerable to environmental racism and exposed to poor air quality affecting their respiratory health [30]. Additionally, the Salton Sea's border is home to the Torres Martinez Desert Cahuilla Indians. While these lands present safety for undocumented immigrants, especially members of the Purépecha community, they are also sites of economic abuses (e.g., inflated rent) and environmental hazards (illegal dumping and fires) [13,31].

These Latinx and Purépecha populations are vulnerable to structural inequities in health due to their race/ethnicity, immigration status, indigeneity, and geographic locale in the US-Mexico borderlands.

2.1.3. Participant Recruitment

We used convenience (nonrandomized) and snowball sampling to recruit participants into the study. Snowball sampling, a variant of chain sampling, permitted the community investigator and CAB members to reach out through their social and professional networks to share study information and recruit participants into the study. Eligible participants had to be: (1) 18 years or older, (2) a caregiver of a child with asthma symptoms, which could include an official diagnosis or the prescription of asthma medication (e.g., albuterol), (3) live in a community along the Salton Sea (i.e., North Shore, Oasis, Thermal, Mecca, Desert Shore, Salton City), and (4) speak English, Spanish, and/or Purépecha.

2.1.4. Qualitative and Sociodemographic Survey Data Collection

Between September and February 2021, we conducted four focus groups, three in Spanish and one in Purépecha with 16 participants, with a range of 3 to 5 participants per focus group, and 20 one-on-one interviews, 14 in Spanish and 6 in Purépecha. We followed recommendations for obtaining data saturation for focus groups, which can be achieved within 2 to 3 focus groups [32], and 12–15 semi-structured interviews with fairly homogenous samples [33].

The community investigator conducted all data collection in either Spanish or Purépecha. A semi-structured interview guide was used for both focus groups and interviews. The guide elicited information on the following topics: childhood asthma and related chronic health conditions (nosebleeds, allergies), perceptions of air quality (Salton Sea dust) and child health, perceptions of climate change and asthma and related health symptoms, healthcare services use, and home health remedies. Focus groups were the primary method of data collection and were conducted via Zoom video conferencing; however, if participants were not able to access Zoom, they could opt to participate in the research via a one-on-one interview by telephone. Focus groups lasted approximately 90 min and one-on-one interviews 30–60 min. All interviews (group or one-on-one) were audio recorded and transcribed.

Immediately following qualitative data collection, participants were asked to complete a brief sociodemographic survey. Participants could choose to self-administer the survey using a link to a Qualtrics (online) survey or have a team member administer the survey to them. The survey collected basic socio-demographic data (age, gender, race/ethnicity, language, country of origin, employment, and education), relationship to the focal child with asthma (e.g., mother, father, grandparent, or aunt/uncle), number of children and number of those with asthma, housing type, and proximity to the Salton Sea (distance and crossroads). Basic characteristics of caregivers' focal child were also collected, including age, gender, country of origin, language, number of years living near the Salton Sea, and overall health status. Participants received a $20 gift card in appreciation of their time and for sharing their experiences.

2.1.5. Data Analysis

The textual data from focus groups and one-on-one interviews were analyzed as one dataset. A rapid analytic approach using summary templates and matrix analysis was used to analyze the textual data [34]. When engaging marginalized communities in research, we have found this approach to be cost-effective, accessible as it does not require the purchase of software, and engaging as non-academic experts develop skills in analyzing and interpreting qualitative data [35,36]. Team members read each transcript line by line and inserted textual data from the transcripts into the template, developing a summary of responses to the interview questions. The summary also included quotes from the interviews and memos or analytic thoughts. A matrix (focus group/interview ^{x} interview topic) was created, and team members inserted condensed and simplified data from each template into the matrix. By using a template and matrix analysis approach, we engaged in an iterative process of theme identification. This approach permitted us to synthesize and then organize the textual data via the matrix to compare content across interviews (group and one-on-one) and identify patterns and emerging themes. This is a common approach used in applied health services and public health research [37]. Below we describe the patterns that emerged from our analysis of the qualitative data and use quotes in the body of the article and tables as evidence of analytic categories and emergent themes.

3. Results

3.1. Participant Characteristics

A total of 36 caregivers participated in the study and 33 completed the socio-demographic survey. All caregivers and children had lived in communities along the northern part of the Salton Sea for at least six months. As indicated in Table 1, most caregivers were the focal child's mother and were born in Mexico from various states, including Michoacán, Baja California, Veracruz, Sinaloa, Sonora, Tamaulipas, Guerrero, and the capital of Mexico City. All but one of the focal children (i.e., children with asthma or respiratory distress) of caregivers in the study were born in the US. Most children were born in and grew up in a community along the Salton Sea.

Table 1. Characteristics of caregivers and their children living along the Salton Sea (N = 33 [1]).

Demographic Information	N (%)
Gender (caregiver)	
Female	28 (84.9)
Male	5 (15.1)
Age	
18 to 24	1 (3.0)
25 to 34	5 (15.2)
35 to 44	18 (54.5)
45–55	9 (27.3)
Birthplace	
Mexico	32 (97.0)
United States	1 (3.0)
Ethnicity/Race	
Hispanic or Latino	25 (75.8)
Purépecha	8 (24.2)
Primary language	
Spanish	20 (60.6)
Purépecha	5 (15.1)
Bilingual Spanish/English	3 (9.1)
Bilingual Spanish/Purépecha	5 (15.2)
Education (level completed)	
Never attended school	5 (15.2)
Primary school [2]	7 (21.2)
Secondary school [2]	10 (30.3)
High school/GED	9 (27.3)
College/university degree	2 (6.0)
Marital status	
Married or civil union	31 (93.9)
Single or separated	2 (6.1)
Number of children	
1 child	2 (6.1)
2 children	11 (33.3)
3 children	9 (27.3)
4 children	4 (12.1)
5 or more children	7 (21.2)
Employment status	
Employed part time	17 (51.5)
Not employed [3]	15 (45.5)
Disabled	1 (3.0)
Ever worked as farmworker	18 (54.5)
Type of home	
Apartment	3 (9.1)
Single-family home	10 (30.3)
Trailer	20 (60.6)
Relationship to child	
Mother	28 (84.8)
Father	4 (12.1)
Grandmother	1 (3.1)
Focal child place of birth	
United States	31 (93.9)
Mexico	2 (6.1)
Focal child primary language	
English	6 (18.2)
Spanish	4 (12.1)
Bilingual English/Spanish	22 (66.7)
Trilingual English/Spanish/Purépecha	1 (3.0)

Table 1. *Cont.*

Demographic Information	N (%)
Focal child age	
0 to 5	2 (6.1)
6 to 11	9 (27.3)
12 to 14	10 (36.4)
15 to 18	12 (45.5)
Caregivers' perception of focal child's overall health	
Very good	1 (3.0)
Good	15 (45.5)
Moderate	15 (45.5)
Very bad	1 (3.0)
Unsure	1 (3.0)

[1] A total of 36 people participated in either a focus group or one-on-one interview; only 33 participants completed the socio-demographic survey. Some numbers and percentages may not add up due to missing data. [2] In Mexico the school system differs from that of the US education system. Primary school includes kindergarten to 6th grade, secondary school 7th to 9th grade, and the second stage of secondary school includes 10th to 12th grade. [3] Many of the participants who indicated they were not employed in the survey indicated in the qualitative interviews that they were stay-at-home mothers.

3.2. An Overview: The Salton Sea Environment

Across the interviews, participants described the Salton Sea environment as harmful to children's health (see Table 2). They explained that children are exposed to sulfuric smells emitted from the Salton Sea, dust storms, agricultural chemicals, and fires. They described the air as polluted and harmful to the children who breathe it. The following quote illustrates well children's exposure to the effects of the Salton Sea environment:

Table 2. The Salton Sea Environment.

Theme	Caregivers' Perspectives
Toxic smells	"It [the sea] does affect them, because in this community where I live the smell is more frequent and stronger. My daughter who has asthma tells me that she feels like she's choking when she smells that odor. My daughter tells me I feel really sick, my chest hurts when the sea smells like that."~Purépecha interview participant, female "Every time you smell it [sulfur] a lot, there goes the pollution there . . . smells the smell here. Sometimes he's [child] even incapable of breathing, the same smell too."~Latinx focus group participant, female " . . . that smell is something that even irritates children's eyes. Oh, my little girl is very irritated."~Latinx focus group participant, female "The vapor of the lake [Salton Sea], the smell, I think it has a lot to do with that vapor during the time of, of heat, because it evaporates all of that, that smell, that humidity. And, I have seen that ultimately yes, the biggest [smell] has happened during times of heat."~Latinx focus group participant, female
Dust storms	"When it is very windy and there is a lot of dust, the chances of having a [respiratory] crisis is higher, either from allergies or, when, it's very difficult to breathe [because] the [the air] is mostly dust." "The children are outside a lot and there is a lot of wind, and the wind brings the dust from the lake, which is drying up."~Purépecha interview participant, male "It's [the Salton Sea] is drying up. There is a lot of wind . . . it's not something that is just once in a while, but it's constant. A lot of dust comes from there [the Salton Sea], all of that harms a child who has asthma. Everything, the dust, the smells that come off the lake."~Latinx interview participant, female

Table 2. *Cont.*

Theme	Caregivers' Perspectives
Agricultural chemical exposure	"The ranchers have been throwing the chemical waste in the lake, that is why she [participant] says that the dust is associated with public health." ~Latinx and Purépecha focus group participant, female "All the chemicals thrown in the fields . . . it goes into the lake. I mean, this is something that is notorious . . . when you go to the lake and you see the waste from the pesticides in the water, in the dirt . . . "~Latinx focus group participant, female "The pesticide, the chemical wastes of the pesticides, they throw it here [Salton Sea] in the water. And, well also, the lake is drying up . . . it's the children who are breathing it . . . which is perhaps why children have asthma."~Purépecha interview participant, male
Fires	"The fires started; the smoke from the fires came all the way here [Salton City]."~Latinx focus group participant, male "I see that there was a time where the fires were here behind the school, there was a lot of smoke everywhere, all of this hurts them [children]."~Latinx focus group participant, male "You can't go out if it's windy. For example, left now, that there are fires, it's even worse, the symptoms [of h child] are getting worse . . . so it's really alarming that kids can't, sometimes, go out. When they go to school, to be able to go out to be with their classmates, [they] have to go [back inside] because they have problems because they cannot do the exercises that are required of them at school and they have to leave them aside because they have severe allergies or asthma, and that they [kids with asthma] always have to have their inhalers in their backpacks or at school."~Latinx focus group participant, female

> "[The schools] are very, very close to the lake, so when it's hot and windy, the smell, and well, all the contamination rises and the children breath it . . . as you [the interviewer] recall, the fire that happened not long ago? Because all of that affected the kids. My daughter said to me: 'I want to go back to school now'. But, well, it couldn't happen . . . the smoke from the fire was really strong, a situation that in my point of view, it is exceeding or exceeding all [air quality] limits".

Toxic smells. Caregivers shared that during the hot summer months of June, July, and August, the Salton Sea emits sulfuric smells that affect the respiratory health of children. Toxic smells are especially persistent and frequent in the summer months. They described the smell as one of sulfur and breathing the smell as suffocating. A mother shared: "My daughter, who has asthma tells me that she feels like she's choking when she smells that odor [from the Salton Sea]. She tells me: 'I feel really sick, my chest hurts when the [Salton] Sea smells like that'". Continuing to discuss her daughter's experience, this mother explained: "[She] tells me that she feels like she is drowning when she smells that odor". Another mother shared a similar experience of the effects of the Salton Sea's smell on her son's health. "Every time you smell it [the Salton Sea] . . . the pollution there . . . sometimes he's even incapable of breathing".

Dust storms. During interviews, caregivers talked about the extreme weather events, specifically dust storms, that are commonplace and may occur over multiple days and are pronounced during the hot summer months. During these dust storms children often experience increased respiratory symptoms and allergies, such as irritated and watery eyes. As this mother shared: "When it is windy and there is a lot of dust, getting an [asthma] attack or having allergies is really high. It is very difficult to breathe".

Chemicals. Caregivers discussed children's exposure to agricultural chemicals from the nearby agricultural fields. Children are exposed by the proximity to the field as well as household members who work in the fields and bring chemicals into the homes via their work clothes. They discussed that children in trailer parks, which are located in close proximity to the fields, are especially vulnerable: "There are a lot of pesticides around the

communities where they [children] live. Trailer parks—most of the trailer parks are near agricultural fields".

Additionally, participants discussed the harm of local agricultural practices in which growers dump chemicals into the Salton Sea: "The growers are unloading their planters, everything goes there. We don't know how much they clean the water. But I think there are studies in which they say there are quite a lot of chemicals in the water". This participant continued to explain why such agricultural practices are problematic for respiratory health:

> "It [the Salton Sea] is drying up because they no longer supply it with the water that they used to supply it with. Everything [agricultural toxins] is left on the lake's shores. When it's windy, all this dust goes into our lungs".

Fires. Additionally, participants talked about the burning of garbage on nearby tribal lands and its effects on air quality. In recent years, fires have occurred near schools: "There was a time when the fires occurred behind a school. There was so much dust everywhere. All of this harms them [children]".

3.3. Childhood Chronic Health Conditions

Caregivers explained how daily exposure to the Salton Sea environment contributed to chronic child health conditions, including asthma and other respiratory conditions, as well as allergies and nosebleeds (see Table 3). Many described their children's lung health as poor—their breathing was weak, and they experienced frequent chest pain and wheezed often. "His throat is closed, he has a whistle", shared one mother. For many children, their chronic health conditions began at infancy or toddlerhood and continued throughout childhood. A mother shared: "When he was six months old, he got really sick. We took him to Mexicali [Mexico] and they told me to put him on a nebulizer and pat him on the back every 15 min to get rid of all the phlegm".

Table 3. Children's Asthma and Co-presenting Health Conditions.

Theme	Children's Lived Experience as Shared by Their Caregivers
Asthma	"The youngest of my children, every so often we have to admit him to the hospital for the same reason . . . he would catch pneumonia and sometimes we would go to the doctor and he [the doctor] would say that he [the child] had bronchitis and almost always, for almost a year we have to hospitalize him three times, four times a year."
	" . . . [child] has more problems with asthma attacks in the month of February, March, April, and June."~Purépecha interview participant, female
	"When he was six months old, well, he got really sick. We took him to Mexicali, and they told me to put a nebulizer on him and pat him on the back every 15 min to get rid of all the phlegm."~Latinx interview participant, female
	" . . . Ever since they operated on him, now, because he used a lot of those little devices to breathe, they put tubes like those in his nose, like little hoses with the mask, he had to use the tubes every so often and a little device that made steam like that to cleanse the lungs, and they gave him an inhaler, they gave him one or two in case he ran out of one, so he had a replacement . . . . The doctor had said it was like asthma that [my] kid was already having asthma, and they sent him to a specialist, and they had to operate on him there [hospital] . . . "~Purépecha interview participant, female
	" . . . he [child] already visited a specialist and checked him out and already said that he had to burn his tonsils with a laser and remove the meatiness [flesh] from his nose. And, well, thanks to that, since then, he has never gotten sick again, not the flu nor any coughing. Because he started coughing and coughing and you could almost see him, he was going to die when he started coughing. He couldn't breathe because he was drowning and what was happening to him scared us at night, when he started snoring . . . it scared us because he couldn't breathe. We had to take him to the emergency room and his tummy was jumping a lot, because he couldn't breathe, his tummy was jumping like he was breathing very fast, but at the same time he couldn't let it go again and his tummy was jumping very fast."~Latinx interview participant, male

Table 3. *Cont.*

Theme	Children's Lived Experience as Shared by Their Caregivers
Allergies	"My eldest child gets them [allergies], that's when he gets his attacks . . . and he has an inhaler. But he's almost like, every day, at night I hear him breathing, even though he's not using the inhaler, I hear him struggle . . . . I don't sleep much because I'm waiting to see if he's breathing well or not."~Latinx interview participant, female
	"They [doctor] diagnosed [child], [with] asthma, because she [doctor] did some different studies, she sent me to do tests, the pulmonologist, allergies, everything . . . [doctor] sent him [child] to him [doctor], the nose and throat specialist because he [child] was bleeding from the nose. Then the doctor told him that he had a lot of allergies and that his veins were wearing out. That he [child] had a deviated septum and that his veins were so irritated, that they [doctors] could burn them."~Latinx interview participant, female
	" . . . there are respiratory problems and a lot of runny noses, or a lot of mucus, like green. As if [child] had a really bad cold, and [child's] eyes are watery, their [child's] eyes swell. And, this is mostly [happening] when it's hot, when it is humid"~Latinx interview participant, female
Nosebleeds	"There are seasons where they [kids] suddenly bleed. My child . . . sometimes his nose bleeds or he gets up and there is blood on his pillow. So yeah, if it's something like that, [I have] some concern. He would even stain his feet, so it was like a little stream of blood that would spill."~Latinx interview participant, female
	"One of the symptoms that my daughter has, and has struggled a lot with it, is the bleeding. Every change in weather there is a tremendous amount of [nose] bleeding that she suddenly just goes down and can't stop bleeding"~Latinx focus group participant, female
	"Other children that I know well who have nosebleeds, and it is something that they [kids] don't need to be out in the sun that much to start bleeding and bleeding and bleeding . . . "~Latinx focus group participant, female

Asthma and respiratory distress. Children commonly experienced an illness trajectory that began with pneumonia, progressed to bronchitis, and ended with an asthma diagnosis or prescription of asthma medications (e.g., albuterol). Throughout this illness trajectory children were repeatedly hospitalized. A caregiver shared:

> "The youngest of my children, we constantly have to admit him into the hospital for the same thing: Due to the cold air he would turn purple and would get pneumonia. Sometimes we would go to the doctor and [they] would tell us that he has bronchitis. We have to hospitalize him three or four times a year".

Chronic and multiple health conditions were common among the caregivers' children. A mother shared that despite her son having been diagnosed and treated for asthma, he continued to experience chronic respiratory health conditions.

Allergies. In addition to asthma and respiratory conditions, caregivers described their children as experiencing chronic allergies visible as rashes, irritated eyes, and runny noses. Caregivers talked about their children's eyes being "watery" or "puffy" especially with heat and humidity. A mother described her son's coexisting health conditions:

> "[He has] respiratory problems and lots of postnasal drip or lots of mucus, like green [mucus]. As if he has the flu, it's a very strong flu and [he has] watery eyes. His eyes get very puffy and more than anything, it's when it's hot, when it's humid".

Caregivers understood that air quality and weather conditions affected their children's health:

> "On days when there is a lot of wind, they [children] cannot go outside for very long. They go out for five minutes and come back in, because they cannot stand being outside for long. The air smells bad and their allergies start".

Nosebleeds. Another common chronic health condition among the caregiver's children was nosebleeds linked to changing weather patterns and heat. "One of the symptoms my daughter has, and she's struggled a lot with, is nosebleeds." This mother explained her

daughter gets sudden nosebleeds in which she "cannot stop bleeding" spurred by changes in the weather. Another caregiver shared her understanding of nosebleeds among children in general and the unique case of children living along the Salton Sea:

> "I have heard that children get nose bleeds. In my town [in Mexico] they always say that if their [children's] nose bleeds it's because of the heat. However, here [along the Salton Sea], it's all year long that their noses' bleed. One of my children's noses bleeds a lot. I think it's because of the environment, because I've already taken him to the doctor and the doctor does not tell me anything. He tells me it's normal".

Caregivers discussed their understanding of how the Salton Sea's environment– air pollution evidenced by sulfuric smells, dust storms, and fires—contributes to nosebleeds. This mother shared:

> "It [son's chronic health condition] is related to the Salton Sea's dust. Because my child has a lot of nosebleeds. It is something that is very worrisome. The doctors tell me that there is no medicine to stop the bleeding. I have noticed that in the month of February, this is when my son's nose bleeds the most. I've already taken him to the doctor: 'Why does my child have a nosebleed in the seasons when it's windy?' When we went to the Central Valley, they did not have nosebleeds. Nor did my little girl who has asthma have breathing problems or asthma attacks".

This quote illustrates a common pattern: When caregivers remove their children from the Salton Sea's environment, their symptoms improve. As she and others explained, children's respiratory symptoms reduce or stop altogether, and they no longer experience chronic nosebleeds.

4. Discussion

Our study presents caregivers' understanding of the environmental impacts of the Salton Sea environment on child health. Participants in our study talked about how agricultural practices such as the waste of pesticides being dumped into the lake, the burning of trash on tribal lands, and the lack of water going into the Salton Sea create a highly toxic environment that is harmful to children's health. Caregivers overwhelmingly report that the Salton Sea environment, including toxic smells and dust storms, contributes to their children's health conditions. The air quality around the Salton Sea, heavily influenced by the deterioration of the surrounding ecosystem and the blowing of dust particles from the Salton Sea's drying lakebed, is a significant local, regional, and statewide concern [22,24]. One that is ever more concerning given climate change. Rising temperatures brought on by climate change have contributed to water evaporation, exposing toxins in the lakebed [38]. As our study finds, caregivers' children are exposed to toxins in the lakebed via dust storms as they breathe this air, which harms their health by contributing to asthma severity (e.g., evidenced by emergency room use and hospitalizations), allergies (e.g., irritated and watery eyes), and nosebleeds.

Findings from our study contribute to ongoing discussions about the effects of drying saline lakebeds on children's health [39], providing a critical understanding of such effects on the respiratory health of structurally vulnerable child populations, that is, low-income racial/ethnic and Indigenous Mexican children in rural borderland communities. Study findings are similar to those of Farzan et al.'s [14] research in the Imperial Valley along the southern part of the Salton Sea. They reported asthmatic and non-asthmatic symptoms in children, including wheezing (35%), allergies (36%), bronchitis-like symptoms (28%), and dry cough (33%)—symptoms that are also common among children living along the northern part of the Salton Sea. Our study thus advances the understanding of the effects of environmental exposures on children's health on both ends of the Salton Sea. It also provides evidence of chronic health conditions that co-present, allergies and nosebleeds, with asthma/respiratory distress in this child population.

A unique finding and important contribution to the literature was the presence of chronic nosebleeds among children living near the Sea. Nosebleeds in children (or pediatric epistaxis) are caused by broken blood vessels and the bleeding of tissues inside the nose. Fluctuations in temperature, humidity, and air pollution are linked to the incidence of epistaxis. Research indicates that the main cause of nosebleeds are high temperatures and low humidity, as well as PM_{10}, such as dust, pollen, and mold. Akdoğan and colleagues [40] found in their study among children accessing outpatient care for nosebleeds that epistaxis is positively associated with average daily temperature, and the difference between the maximum and minimum daily temperature is negatively associated with fluctuations in average daily humidity. Kim and colleagues [41] found that air quality or meteorological factors, specifically PM_{10} concentration, were associated with daily epistaxis presentation in both child and adult patient populations in Korea.

Based on the perspectives of caregivers in our study, epistaxis or nosebleeds in children living along the Salton Sea, is likely related to high temperatures and low humidity as nosebleeds commonly aligned with seasonal temperature changes and were pronounced during the hot summer months of June, July, and August. Yet, there is not sufficient evidence to conclude that temperature fluctuations or fine particulates are the main cause of nosebleeds in children. Our findings and those of others raise questions about the potential impact of climate and seasonal weather patterns and PM_{10} on the health and wellbeing of children living near the Salton Sea.

5. Limitations

Study findings offer insight into the lived experiences of Latinx and Indigenous Mexican caregivers of children with asthma/respiratory problems and co-presenting chronic health conditions of allergies and nosebleeds. The following limitations should be considered when interpreting the findings. First, we merged one-on-one interview data with focus group data to accommodate the needs of study participants who had limited access to digital technology or felt uncomfortable in group settings. While we used the same semi-structured interview guide for both data collection methods, the purpose and goals of each method of data collection differ. One-on-one interviews are best used to obtain individual level experiences and perspectives, whereas focus groups are ideal for obtaining shared collective experiences and perspectives of a community or group [42,43]. For some, it was their first time participating in research, and they did not feel comfortable sharing their perspectives in a group setting, whereas others preferred participating in the research in their native tongue Purépecha both of which limited focus group participation and increased participation in one-on-one interviews. Additionally, in several cases, the participants had limited skills in using digital technology or had limited access to WIFI, resulting in a preferred method of one-on-one phone interviews. For this reason, the focus group sizes were quite small as the ideal focus group size is six to ten participants, which permits facilitators to engage diverse voices and perspectives in group conversations [44].

6. Conclusions

Too often, low-income immigrant and minority children in the US live in environments where they breathe highly polluted air [45,46]. This is evident in our study amongst the Latinx and Purépecha immigrant children and caregivers living along the Salton Sea—these families are surrounded by a drying lakebed that emits sulfuric smells and exposes toxic playa that is transported into the air, which children then breathe. This study has important public health implications for vulnerable child populations. The case of the Salton Sea and its effects on the children and families living along its border offers a preview into what is to come in the next several decades. Experts in the field and global health organizations (e.g., World Health Organization) anticipate significant increases in global emissions and air pollutants due to climate change contributing to poor air quality and subsequent increases in asthma and related respiratory conditions [47,48]. Without intervention, structurally vulnerable child populations, like those in our study, will be especially vulnerable to

respiratory health consequences of climate change and the effects of poor air quality on health.

Author Contributions: A.M.C. and M.P. designed the study and study instruments and oversaw data collection and analysis. A.M.C., M.P., S.R., G.O., A.T., A.G., A.M. and J.C. analyzed and interpreted the data. A.M.C. wrote the main manuscript, G.O. prepared Table 1 and all other authors contributed to the writing of different sections of the manuscript. All authors reviewed the manuscript. All authors have read and agreed to the published version of the manuscript.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The datasets used and analyzed for this study can be available from the corresponding author upon reasonable request.

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2022 Consumer Confidence Report for Public Water System D & M WSC

This is your water quality report for January 1 to December 31, 2022

D & M WSC provides self-supplied and purchased groundwater from the **Carrizo-Wilcox aquifer** and purchased Surface Water from the **Nacogdoches Lake/ Reservoir** located in Nacogdoches County

For more information regarding this report contact:

Name _Donnie Babb_____

Phone _936 - 559 - 9900 _____

Este reporte incluye información importante sobre el agua para tomar. Para asistencia en español, favor de llamar al telefono (936) 559-9900

Definitions and Abbreviations

Definitions and Abbreviations	The following tables contain scientific terms and measures, some of which may require explanation.
Action Level:	The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.
Avg:	Regulatory compliance with some MCLs are based on running annual average of monthly samples.
Level 1 Assessment:	A Level 1 assessment is a study of the water system to identify potential problems and determine (if possible) why total coliform bacteria have been found in our water system.
Level 2 Assessment:	A Level 2 assessment is a very detailed study of the water system to identify potential problems and determine (if possible) why an E. coli MCL violation has occurred and/or why total coliform bacteria have been found in our water system on multiple occasions.
Maximum Contaminant Level or MCL:	The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.
Maximum Contaminant Level Goal or MCLG:	The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.
Maximum residual disinfectant level or MRDL:	The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.
Maximum residual disinfectant level goal or MRDLG:	The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.
MFL	million fibers per liter (a measure of asbestos)
mrem:	millirems per year (a measure of radiation absorbed by the body)
na:	not applicable.
NTU	nephelometric turbidity units (a measure of turbidity)
pCi/L	picocuries per liter (a measure of radioactivity)

Definitions and Abbreviations

ppb:	micrograms per liter or parts per billion
ppm:	milligrams per liter or parts per million
ppq	parts per quadrillion, or picograms per liter (pg/L)
ppt	parts per trillion, or nanograms per liter (ng/L)
Treatment Technique or TT:	A required process intended to reduce the level of a contaminant in drinking water.

Information about your Drinking Water

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surf ace of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPAs Safe Drinking Water Hotline at (800) 426-4791.

Contaminants that may be present in source water include:

- Microbial contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildl ife.

- Inorganic contaminants, such as salts and metals, which can be naturally-occurring or result from urban storm water runoff, industrial or domestic wastewater dis charges, oil and gas production, mining, or farming.

- Pesticides and herbicides, which may come from a variety of sources such as agriculture, urban storm water runoff, and residential uses.

- Organic chemical contaminants, including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, and can also come from gas stations, urban storm water runoff, and septic systems.

- Radioactive contaminants, which can be naturally-occurring or be the result of oil and gas production and mining activities.

In order to ensure that tap water is safe to drink, EPA prescribes regulations which limit the amount of certain contaminants in water provided by public water syste ms. FDA regulations establish limits for contaminants in bottled water which must provide the same protection for public health.

Contaminants may be found in drinking water that may cause taste, color, or odor problems. These types of problems are nonecessarily causes for health concern s. For more information on taste, odor, or color of drinking water, please contact the system's business office.

You may be more vulnerable than the general population to certain microbial contaminants, such as Cryptosporidium, in drinking water. Infants, some elderly, or i mmunocompromised persons such as those undergoing chemotherapy for cancer; persons who have undergone organ transplants; those who are undergoing trea tment with steroids; and people with HIV/AIDS or other immune system disorders, can be particularly at risk from infections. You should seek advice about drinking water from your physician or health care providers. Additional guidelines on appropriate means to lessen the risk ofinfection by Cryptosporidium are available from the Safe Drinking Water Hotline (800-426-4791).

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from m aterials and components associated with service lines and home plumbing. We are responsible for providing high quality drinking water, but we cannot control the v ariety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize thepotential for lead exposure by flushing y our tap for 30 seconds to 2 minutesbefore using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water teste d. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available fromthe Safe Drinking Water Hotline or at http:// www.epa.gov/safewater/lead.

Information about Source Water

D & M WSC provides self-supplied and purchased groundwater from the **Carrizo-Wilcox aquifer** and purchased Surface Water from the **Nacogdoches Lake/Reservoir** located in Nacogdoches County.

TCEQ completed an assessment of your source water, and results indicate that some of our sources are susceptible to certain contaminants. The sampling requirements for your water system is based on this susceptibility and previous sample data. Any detections of these contaminants will be found in this Consumer Confidence Report. For more information on source water assessments and protection eff orts at our system contact Donnie Babb at 936-559-9900

Lead and Copper	Date Sampled	MCLG	Action Level (AL)	90th Percentile	# Sites Over AL	Units	Violation	Likely Source of Contamination
Copper	2022	1.3	1.3	0.929	3	ppm	N	Erosion of natural deposits; Leaching from wo od preservatives; Corrosion of household plu mbing systems

2022 Water Quality Test Results

Disinfection By-Products	Collection Date	Highest Level Dete cted	Range of Individua l Samples	MCLG	MCL	Units	Violation	Likely Source of Contamination

Haloacetic Acids (HAA5)	2022	33	22.4 - 35.1	No goal for the total	60	ppb	N	By-product of drinking water disinfection.

*The value in the Highest Level or Average Detected column is the highest average of all HAA5 sample results collected at a location over a year

Total Trihalomethanes (TTHM)	2022	65	38.8 - 72.2	No goal for the total	80	ppb	N	By-product of drinking water disinfection.

*The value in the Highest Level or Average Detected column is the highest average of all TTHM sample results collected at a location over a year

Inorganic Contaminants	Collection Date	Highest Level Detected	Range of Individual Samples	MCLG	MCL	Units	Violation	Likely Source of Contamination
Barium	2022	0.02	0.02 - 0.02	2	2	ppm	N	Discharge of drilling wastes; Discharge from metal refineries; Erosion of natural deposits.
Chromium	2022	8.1	8.1 - 8.1	100	100	ppb	N	Discharge from steel and pulp mills; Erosion of natural deposits.
Fluoride	2022	0.139	0.139 - 0.139	4	4.0	ppm	N	Erosion of natural deposits; Water additive which promotes strong teeth; Discharge from fertilizer and aluminum factories.
Nitrate [measured as Nitrogen]	2022	0.04	0.0202 - 0.04	10	10	ppm	N	Runoff from fertilizer use; Leaching from septic tanks, sewage; Erosion of natural deposits.

Radioactive Contaminants	Collection Date	Highest Level Detected	Range of Individual Samples	MCLG	MCL	Units	Violation	Likely Source of Contamination
Beta/photon emitters	2022	5	0 - 5	0	50	pCi/L*	N	Decay of natural and man-made deposits.

*EPA considers 50 pCi/L to be the level of concern for beta particles.

Volatile Organic Contaminants	Collection Date	Highest Level Detected	Range of Individual Samples	MCLG	MCL	Units	Violation	Likely Source of Contamination
Xylenes	2022	0.00171	0 - 0.00171	10	10	ppm	N	Discharge from petroleum factories; Discharge from chemical factories.

Disinfectant Residual

A blank disinfectant residual table has been added to the CCR template, you will need to add data to the fields. Your data can be taken off the Disinfectant Level Quarterly Operating Reports (DLQOR).

Disinfectant Residual	Year	Average Level	Range of Levels Detected	MRDL	MRDLG	Unit of Measure	Violation (Y/N)	Source in Drinking Water
	2022			4	4		ppm	Water additive used to control microbes.

Addressing Drought

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Water is essential to feeding families, growing crops, sustaining wildlife and the environment, and powering agricultural businesses. Unfortunately, the climate crisis has created drought conditions in the west that continue to worsen, leading to historically low water allocations.

With the Bipartisan Infrastructure Law, President Biden took the historic step to provide critical funding to address water and drought challenges and invest in our nation's western water and power infrastructure while rebuilding our existing projects to withstand a changing hydrology.

The infrastructure law provides $8.3 billion for the Bureau of Reclamation's water infrastructure programs and $2.5 for authorized water rights settlement projects (more details on our Tribal Investments page). The funding includes:

- **$1 billion for WaterSMART Programs** to support reuse projects, with $550 million for Title XVI (Water Reclamation and Reuse Projects), and $450 million for large-scale projects.
- **$1 billion for rural water projects** to support projects that have been authorized by an Act of Congress before July 1, 2021, to meet the critical water supply needs of rural communities and Tribal nations.
- **$500 million for dam safety** projects that will fund construction and maintain the operational capacity of 12 dams that require modification and minimize risk to the public.
- **$300 million to implement the Colorado River Basin Drought Contingency Plan**, designed to protect the Colorado River system through voluntary reductions and increased conservation.
- **$250 million for Aquatic Ecosystems Restoration** to invest in the health of fisheries, wildlife or aquatic habitat through habitat restoration and improved fish passage.
- **$250 million for desalination construction** to support the development and supplement municipal and irrigation water supplies through the treatment of ocean or brackish water, providing a local supply and flexibility during water shortages.

- **$100 million for watershed health projects**, including the design, implementation and monitoring of conservation outcomes of habitat restoration projects that improve watershed health.
- **$100 million for small surface water and groundwater storage**, which will invest in small water storage with a capacity of not less than 2,000 acre-feet and not more than 30,000 acre-feet and increases surface water or groundwater storage; or conveys water to or from surface water or groundwater storage.

The Bipartisan Infrastructure Law makes one of the largest investments in drought resilience in the nation's history, showing the urgent need to minimize the impacts of drought and develop a long-term plan. The Interior Department is helping to marshal existing resources and work in partnership with irrigators and local, state and Tribal governments to address and develop these long-term measures while combatting climate change and restoring lands, water and wildlife.

Resources:

- Bureau of Reclamation Bipartisan Infrastructure Law Investments
- Bureau of Reclamation WaterSMART program
- Bureau of Reclamation Drought Program

Investing in Water Management Strategies

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Biden-Harris Administration Announces New Agreement with Imperial Irrigation District to Save 100,000 Acre-Feet of Water in Colorado River System

12/04/2023
Last edited 12/04/2023

WASHINGTON — The Biden-Harris administration today announced an agreement with the Imperial Irrigation District (IID) that will conserve approximately 100,000 acre-feet of water in Lake Mead in 2023. The agreement includes approximately $77.6 million in new investments from President Biden's Investing in America agenda, which will fund projects for water conservation, water efficiency, and protection of critical environmental resources in the Colorado River System this year.

The investments, which are part of the Biden-Harris administration's whole-of-government approach to improve and protect the stability and sustainability of the Colorado River System now and into the future, are administered through the Lower Colorado River Basin System Conservation and Efficiency Program and funded by the Inflation Reduction Act, the largest climate investment in history.

In addition, Reclamation and IID continue to work on an agreement for years 2024 through 2026. Combined, the IID agreements over the next three years are expected to achieve up to 800,000 acre-feet of system water conservation to shore-up elevations in Lake Mead for the benefit of the Colorado River System and the over 40 million people who rely on it.

"Through President Biden's Investing in America agenda, the Lower Colorado River Basin System Conservation and Efficiency Program is helping address, improve and protect the long-term stability of the Colorado River System," said **Principal Deputy Assistant Secretary for Water and Science Michael Brain**. "The Biden-Harris administration is using every tool and resource at our disposal to continue our sustained, collaborative progress in increasing water conservation across the West."

"We are grateful for the Imperial Irrigation District's leadership and partnership as we worked to execute this agreement," said **Reclamation Commissioner Camille Calimlim Touton**. "Addressing the drought crisis requires an all-hands-on-deck moment and close collaboration among federal, state, Tribal and local communities. IID's commitment to system conservation is vital as we work to strengthen the stability of the entire Colorado River Basin."

President Biden's Investing in America agenda is integral to the efforts to increase near-term water conservation, build long term system efficiency, and prevent the Colorado River System's reservoirs from falling to critically low elevations that would threaten water deliveries and power production.

The IID agreement announced today is in addition to the 18 recently announced agreements executed in Arizona that commit water entities to conserve up to 348,680-acre feet of water in Lake Mead in 2023, and up to 984,429-acre feet through 2026. The agreements are part of the 3 million acre-feet of system conservation commitments made by the Lower Basin states, 2.3 million acre-feet of which will be compensated through funding from the Inflation Reduction Act.

Through the Bipartisan Infrastructure Law, Reclamation is investing another $8.3 billion over five years for water infrastructure projects, including water purification and reuse, water storage and conveyance, desalination, and dam safety.

As a result of the commitment to record volumes of conservation in the Basin, as well as recent hydrology, Interior Department announced in October that the chance of falling below critical elevations has been reduced to eight percent at Lake Powell and four percent at Lake Mead through 2026. Lake Mead is currently about 40 feet higher than it was projected to be at this time last year.

To date, the Interior Department has announced the following investments for Colorado River Basin states through the Bipartisan Infrastructure Law and Inflation Reduction Act, which will yield hundreds of thousands of acre-feet of water savings each year once these projects are complete:

- $281 million for 21 water recycling projects that are expected to increase annual water capacity by 127,000 acre-feet annually;
- Up to $233 million in water conservation funding for the Gila River Indian Community, including $83 million for a water pipeline project;
- Over $73 million for infrastructure repairs on water delivery systems; $19.3 million in fiscal year 2022and another $54 million announced in April 2023;
- $71 million for 32 drought resiliency projects to expand access to water through groundwater storage, rainwater harvesting, aquifer recharge and water treatment;
- $50 million over the next five years to improve key water infrastructure and enhance drought-related data collection across the Upper Colorado River Basin; and
- $20 million in new small surface and groundwater storage

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Inflation Reduction Act Funds Landmark Agreements to Accelerate Salton Sea Restoration

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11/28/2022
Last edited 11/29/2022

Date: Monday, November 28, 2022
Contact: Interior_Press@ios.doi.gov

WASHINGTON — The Department of the Interior today announced a historic agreement funded by the Inflation Reduction Act that will mitigate impacts from the worsening drought crisis impacting the Salton Sea in Southern California.

Established by Deputy Secretary Tommy Beaudreau and leaders from the California Natural Resources Agency, Imperial Irrigation District (IID) and Coachella Valley Water District (CVWD), the agreement will accelerate implementation of dust suppression and aquatic restoration efforts at the Salton Sea in Southern California. The agreement, which is set for consideration by the IID board of directors at its meeting tomorrow, will expedite implementation of the state's 10-year plan and enable urgent water conservation needed to protect Colorado River reservoir storage volumes amid persistent climate change-driven drought conditions.

"The Biden-Harris administration is committed to bringing every resource to bear to help manage the drought crisis and provide a sustainable water system for families, businesses and our vast and fragile ecosystems. This landmark agreement represents a key step in our collective efforts to address the challenges the Colorado River Basin is facing due to worsening drought and climate change impacts," said **Deputy Secretary Beaudreau**. "Historic investments from the Inflation Reduction Act will help to support the Imperial and Coachella Valley and the environment around the Salton Sea, as well as support California's efforts to voluntarily save 400,000 acre-feet a year to protect critical elevations at Lake Mead."

The Salton Sea, California's largest lake, is receding due to the drought crisis gripping the West and resulting necessary conservation actions in the Imperial Valley that have reduced inflows to the Sea. Exposed lakebed is contributing to harmful dust emissions to the surrounding environment and reducing important environmental habitat for wildlife.

Under the agreement, the Interior Department's Bureau of Reclamation will provide $22 million in new funding through the Inflation Reduction Act in fiscal year 2023 to implement projects at the Sea, support staffing at the Torres Martinez Desert Cahuilla Indian Tribe, and conduct scientific research and management that contributes to project implementation.

Subject to the implementation of voluntary conservation actions proposed by IID and CVWD, Reclamation will also provide an additional $228 million over the next four years to expedite existing projects and bolster staffing capacity at the water agencies to help deliver new projects. This is in support of California's commitment to voluntarily conserve 400,000 acre-feet annually, starting in 2023. This $250 million investment from the Inflation Reduction Act will complement the $583 million in state funding committed to date.

"This agreement is a huge step forward," said **California Natural Resources Secretary Wade Crowfoot**. "It builds our momentum delivering projects at the Sea to protect communities and the environment and ensures that California's leadership conserving Colorado River water supplies doesn't come at the expense of local residents."

Under the agreement, the California Natural Resources Agency commits to accelerating project delivery through permit streamlining and use of its full contracting authority. It also commits to continue pursuing additional funding for projects to build on state funding already committed to Salton Sea Management Program implementation.

The Interior Department, IID and CVWD have agreed to establish programmatic land access agreements to enable state agencies to implement projects. In addition, the two water agencies will provide available future water supplies for new projects. This will enable California water agencies to commit to voluntarily reduce their water usage each year beginning in 2023 through 2026 to protect critical elevations in Lake Mead.

The Colorado River provides water to two countries, seven western states, 30 Tribal Nations and 40 million residents. It is currently experiencing the longest and worst drought on record, driven by hotter temperatures under climate change. Efforts continue in California and across the Colorado River Basin to find ways to stabilize water storage volumes in Lakes Powell and Mead. Reclamation and water agencies are working closely to take extraordinary actions to protect the Colorado River System.

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What You Should Know About the Pacific Flyway

December 11, 2017

« All Blog Posts

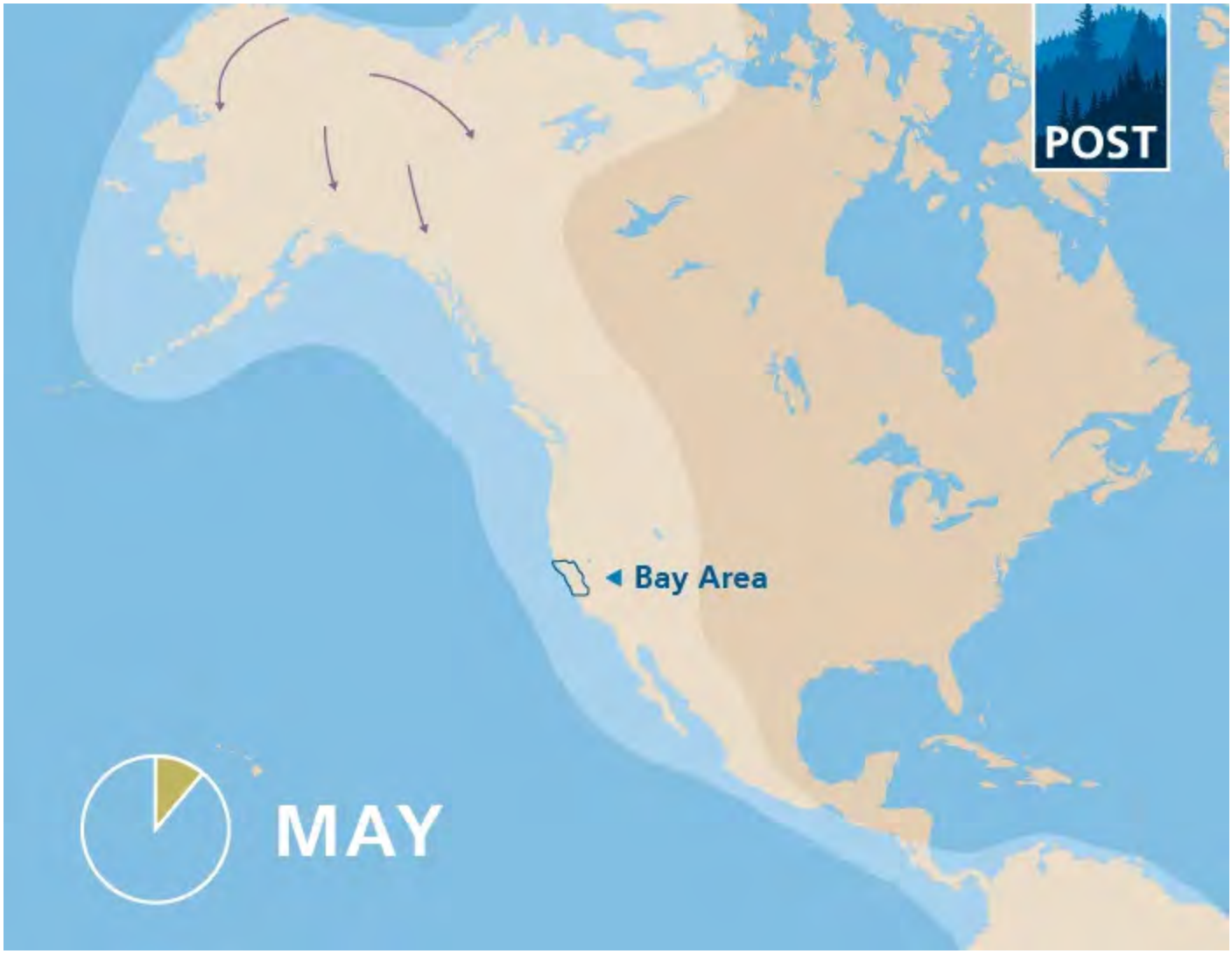
By Matt Dolkas,
Former Content Marketing Manager

It's December and it's getting properly cold outside. With winter on the horizon, birds across the continent are moving south and on these cold late-fall mornings I sometimes wish I could do the same.

The lack of an abundant food source is what, for most, demands a move south. And for some species, this means flying as far as Central and South America.

It's always amazed me how birds find their way during these annual migrations. Some scientists believe migratory birds take their navigational cues from the sun, moon and stars. Others think they simply follow geographic landmarks like rivers and mountains. Nobody knows for sure and maybe never will.

What we do know is that migratory birds consistently follow the same flight paths, converging every year on "flyways." Think of them like nature's interstate system.



The Pacific Flyway (roughly illustrated above) is one of four flyways in North America used by migratory birds for their annual migrations. The San Francisco Bay, and the diversity of habitat surrounding the Bay, create one of the most important stopovers for migratory birds on this flyway.

There are four flyways that span across North America–the Pacific, Central, Mississippi and Atlantic Flyways (don't worry, there won't be a quiz on any of this).

California lies within the Pacific Flyway, an area that stretches from the Arctic to the coast of Mexico, and from the Rocky Mountains to the Pacific. North to south it's over 4,000 miles long and, in places, over 1,000 miles wide.

The San Francisco Bay is a critically important stopover for birds moving along the Pacific Flyway. As the largest estuary (tidal mouth of a large river) on the Pacific coasts of both North and South America, the Bay offers an abundance of habitat for tired migrant birds. And it's not just wetlands that make th[illegible]ay Area so attractive. There's a diversity of habitat types here offering refuge for birds of al[illegible]an avian paradise.

Society is leading an effort to identify, monitor and protect the planet's most important places for birds. These areas are determined using internationally agreed criteria and are called, quite simply, "Important Bird Areas."

The interactive map below illustrates our region's IBAs and the overlap between these areas and the land we've helped protect. Explore more below and learn about one of the Pacific Flyways' greatest stopovers:

Terms **This map was created by a user.** Learn how to create your own.

Want to learn more about birds in the Bay Area? Download our Natural Guide to Bay Area Birds—an illustrated guide to the most iconic birds in our open spaces!

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Enforcement

DTSC REACHES SETTLEMENT WITH GEOTHERMAL COMPANY

The Department of Toxic Substances Control has reached a $910,000 settlement with CalEnergy Operating Corporation of Imperial County over alleged violations of the state's hazardous waste laws. CalEnergy produces energy from geothermal resources. It operates seven facilities in Imperial County.

The settlement terminates litigation brought by the state Attorney General against CalEnergy on behalf of DTSC. The violations alleged in the litigation include:
- Illegal treatment, storage, and disposal of waste containing hazardous concentrations of arsenic, antimony, and lead;

- Failure to provide adequate staff training in handling hazardous waste;

- Failure to properly close and secure hazardous waste containers; and

- Failure to properly label containers

The settlement includes $310,000 that will be used by DTSC to fund a variety of Supplemental Environmental Programs; primarily community education programs. The remainder of the fine includes a $480,000 civil penalty and $120,000 that will be used to reimburse DTSC for its administrative costs.

August 31, 2021

Reclaiming Hydrogen for a Renewable Future: Distinguishing Oil & Gas Industry Spin from Zero-Emission Solutions

How to deploy hydrogen as a meaningful climate solution.

A new report from Earthjustice's Right to Zero (https://twitter.com/RightToZeroCA) campaign scrutinizes claims about hydrogen and delves into how to deploy it as a meaningful climate solution.

> **What is "Green Hydrogen"?** Made using 100% renewable electricity to split hydrogen from water molecules, "green hydrogen" is currently the only established way to produce hydrogen without emitting climate or air pollution.
>
> Less than 1% of hydrogen today is produced using renewable energy.

Reclaiming Hydrogen for a Renewable Future (//earthjustice.org/documents/report/reclaiming-hydrogen-for-a-renewable-future) responds to fossil fuel industry marketing efforts pushing the growing interest in hydrogen as a potential clean energy source, and aims to distinguish "green hydrogen" from hydrogen produced from polluting sources like fossil fuels or gas from factory farms.

Green Hydrogen Shows Promise in Specific Sectors

Less than 1% of hydrogen today is produced using renewable energy. "Green hydrogen" is made using 100% renewable electricity to split hydrogen from water molecules. For now, this is the only established way to produce hydrogen without emitting climate or air pollution.

For hydrogen to have a role in our clean energy future, the first priority should be deploying green hydrogen to displace the millions of metric tons of dirty hydrogen that the United States already makes from fossil fuels each year. The limited supply of green hydrogen may also help transition to renewable energy in specific sectors like shipping, aviation, high-heat industrial processes, and long-distance trucking.

Hydrogen Shouldn't Be Used in Homes and Buildings to Replace "Natural" Gas

The report explores whether hydrogen can be used to replace fossil fuels for heating and cooking in homes and buildings, which is responsible for a tenth of the United States' climate pollution and produces health-harming indoor air pollution to boot.

Hydrogen is a false solution for this sector because:

- Electric appliances would be more energy efficient, improve air quality, and avoid the risks of leaking hydrogen, which is both the smallest molecule in the universe and a potent greenhouse gas.
- Injecting hydrogen in appreciable volumes would create safety hazards in our pipelines and household appliances.
- If a gas company used as much green hydrogen as optimistically possible, it would only reduce the climate impact of burning the company's gas by about 7%.

Similarly, because battery electric vehicles are significantly more energy efficient and cheaper than hydrogen vehicles, green hydrogen would be wasted in the vast majority of cars, buses, and trucks.

Policymakers and legislators should be wary of hype around hydrogen. When deployed as a marketing tool by the fossil fuel industry, hydrogen can be used to hinder necessary climate action, like the transition to electric appliances in homes and buildings and the shift to battery electric vehicles. Electrifying our transportation systems and buildings and running them on a renewable energy grid is key to solving both our air quality and climate pollution problems.

Most Hydrogen Uses Today Are an Environmental Justice Problem

> **Climate Costs** Globally, hydrogen production is responsible for more greenhouse gas emissions than the entire country of Germany.

The report illustrates how the latest wave of hype masks the fact that most hydrogen production today pollutes communities and drives climate breakdown. The fossil fuel industry is both the United States' largest producer and consumer of hydrogen, with roughly 60% of the nation's domestic supply deployed in crude oil refining with significant environmental justice impacts. Globally, hydrogen production is responsible for more greenhouse gas emissions than the entire country of Germany.

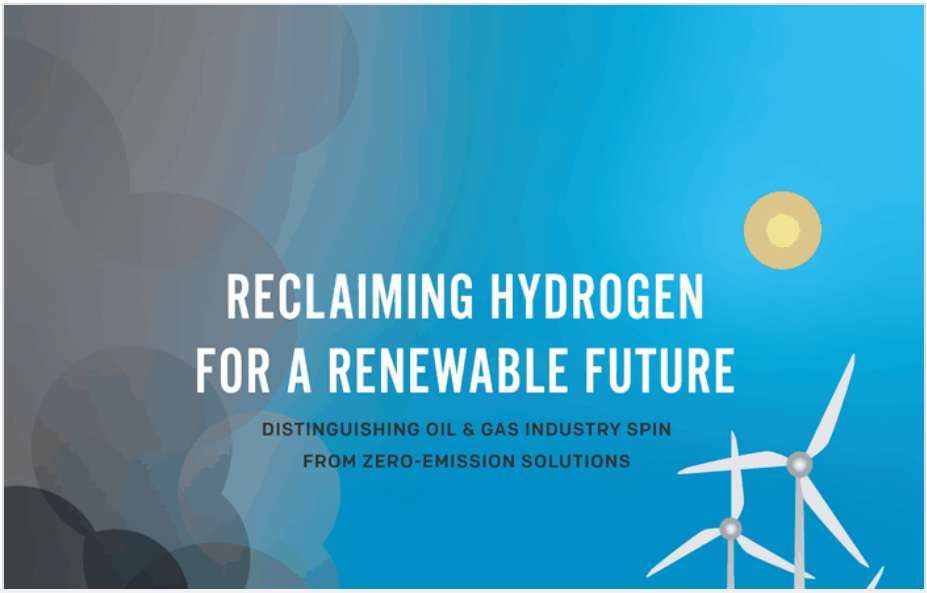
Communities near oil refineries bear the brunt of this pollution because hydrogen production most often takes place at refineries. The report additionally finds that the fossil fuel industry is using vague and unproven promises about the potential to retrofit polluting gas power-plants — which are disproportionately located in communities of color — to justify the construction of new gas power plants and to keep existing plants open.

> **Tweeting about this report?** Join the conversation with #rethinkhydrogen (https://twitter.com/search?q=%23rethinkhydrogen)

If gas-power plants were to be retrofitted to run on hydrogen, the air pollution impacts in frontline communities could be even more devastating. One group of researchers predicted that burning pure hydrogen would emit more than six times as much NOx as burning methane, the main component in fossil gas.

The Report

Download Report (//earthjustice.org/documents/report/reclaiming-hydrogen-for-a-renewable-future) | Download Infographics (https://www.dropbox.com/sh/0ljdsxdfd629wlj/AABHaLk3K7I_S-KK5Lna98sda?dl=0)



Executive Summary

Introduction

I. **Today, hydrogen production relies on fossil fuels and threatens our climate and public health**

II. **The fossil fuel industry is campaigning to increase reliance on hydrogen from fossil fuels**

III. **Hydrogen can become a decarbonization tool in the future if policymakers separate the promising opportunities from fossil fuel industry hype**

1. For now, the only established way to make hydrogen without greenhouse gas emissions is by using renewable energy to fuel electrolysis.

2. *Limitatations of green hydrogen:* Energy inefficiency; Costs; Pollution from combustion; Safe transport and storage; Water use; Time

IV. **Identifying the promising applications for green hydrogen**

1. *Least-regrets uses for green hydrogen:* Displace fossil hydrogen in current uses as an industrial feedstock
2. *Sectors to explore with caution:* Maritime shipping; Aviation; High-heat industrial processes; Long-haul trucks and trains; Long-term storage of renewable electricity paired; with fuel cells
3. *Sectors where hydrogen is not a solution:* Combusting in fossil gas power plants; Gas-burning appliances in homes and commercial buildings; Cars, buses and regional trucks

Conclusion

Endnotes

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Download Report (//earthjustice.org/documents/report/reclaiming-hydrogen-for-a-renewable-future) | Download Infographics (https://www.dropbox.com/sh/0ljdsxdfd629wlj/AABHaLk3K7I_S-KK5Lna98sda?dl=0)

Resources on the Electrification Movement and Climate Misinformation

CalMatters: "Don't be fooled by the Pied Pipers of clean fuels" (https://calmatters.org/commentary/2021/11/dont-be-fooled-by-fossil-fuels-claiming-to-be-clean/)

Commentary from Sara Gersen, Senior Attorney, Right to Zero Campaign, Earthjustice

Rhetoric vs. Reality: The Myth of "Renewable Natural Gas" for Building Decarbonization (//earthjustice.org/features/report-building-decarbonization)

Highlighting the gas industry's deceptive efforts to keep our homes and buildings tethered to gas combustion. Buildings account for nearly 40% of climate pollution in the United States, with much of that driven by the burning of dirty fossil gas for heating and hot water.

Los Angeles Times: "Is California's 'Hydrogen Highway' a Road to Nowhere?" (https://www.latimes.com/politics/story/2021-08-10/hydrogen-highway-or-highway-to-nowhere)

"It is not renewable," said Sasan Saadat, an analyst at Earthjustice. "What they are doing does not make sense." There is so much natural gas involved in the fuel production process, he said, that calling it sustainable is indefensible. While hydrogen could ultimately prove the most effective method to cut emissions from trucks and planes, the Hydrogen Highway concept for cars just isn't penciling out, Saadat said.

Californians Want to Stop Burning Gas in Their Homes (//earthjustice.org/from-the-experts/2020-may/californians-want-to-stop-burning-gas-in-their-homes)

70% of Californians said they prefer efficient electric appliances powered by clean electricity instead of fossil gas.

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"This is what Earthjustice does so well — enforces the law when government is unwilling to do so."

–JANETTE BRIMMER
Attorney in Earthjustice's Northwest Regional Office, on litigation to remove abandoned dams in Oregon that had blocked prime salmon habitat for more than three-quarters of a century

THE STORIES TO READ ON CLEAN ENERGY (HTTPS://EARTHJUSTICE.ORG/GOALS/CLEAN-ENERGY)

Are Electric Vehicles Really Better for the Environment? Yes. (https://earthjustice.org/article/electric-vehicles-are-better-for-the-environment)

You Shouldn't Have to Pay for Utility Shenanigans in Your Energy Bill (https://earthjustice.org/experts/matt-vespa/you-shouldnt-have-to-pay-for-utility-shenanigans-in-your-energy-bill)

TAKE ACTION

Make sure tax dollars go to hydrogen projects that are truly clean (https://earthjustice.org/action/make-sure-tax-dollars-go-to-hydrogen-projects-that-are-truly-clean?ms=web_footer)

WHAT YOU NEED TO KNOW THIS WEEK (HTTPS://EARTHJUSTICE.ORG/LIBRARY)

A Train Full of Toxic Chemicals Derailed in Her Town. Here's What Her Community Needs Now. (https://earthjustice.org/article/a-train-full-of-toxic-chemicals-derailed-in-her-town-heres-what-her-community-needs-now)

Carbon Capture Is Giving a Second Life to Fossil Fuels – But It Doesn't Have To (https://earthjustice.org/article/carbon-capture-is-giving-a-second-life-to-fossil-fuels-but-it-doesnt-have-to)

It's Time to Ban This Solvent Linked to Cancer (https://earthjustice.org/article/why-a-solvent-linked-to-cancer-needs-to-be-banned)

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Via Regulations.gov

U.S. Environmental Protection Agency
EPA Docket Center
Air Docket
Mail Code 28221T
1200 Pennsylvania Avenue NW
Washington, DC 20460

February 10, 2023

Re: **Docket ID No. EPA-HQ-OAR-2021-0427**
Comments of Earthjustice and World Resources Institute

On behalf of our supporters across the country, Earthjustice and World Resources Institute submit these comments in response to the United States Environmental Protection Agency's (EPA's or Agency's) proposed rule setting renewable fuel standards for 2023 through 2025, Docket ID No. EPA-HQ-OAR-2021-0427, Renewable Fuel Standard (RFS) Program: Standards for 2023-2025 and Other Changes, 87 Fed. Reg. 80582, December 30, 2022 (Proposed Rule).

I. INTRODUCTION

In 2007, Congress passed the Energy Independence and Security Act (EISA)[1] to increase the production of renewable fuels and thereby reduce greenhouse gas (GHG) emissions, and to move the United States toward greater energy independence.[2] To ameliorate the growing threat of climate change, Congress included in EISA a new Renewable Fuel Standard (RFS) which, among other things, mandated the mixing of certain biofuels into transportation fuel.[3]

At the time of EISA's enactment, "cellulosic biofuel" – ethanol produced from agricultural waste or purpose-grown perennial energy crops such as switchgrass – was thought to be the most promising path for decarbonizing passenger vehicles. This is reflected in the volume requirements established by Congress, which were intended to ensure the use of 21 billion gallons of "advanced biofuels" in 2022. Of the 21 billion gallons of advanced biofuels, 16 billion gallons were supposed to be cellulosic biofuel. These volumes aimed to achieve at least a 50% reduction in greenhouse gas emissions compared with petroleum-based transportation fuel.

Fifteen years later the world looks fundamentally different. Cellulosic ethanol has completely failed to materialize at commercial scale, despite substantial efforts. At the same time, electric vehicle technology has advanced more rapidly than expected and is now

[1] *See* Pub. L. No. 110-140, § 202(a)(1), 121 Stat. 1492 (2007).
[2] *See* 42 U.S.C. §7545(o).
[3] *See* 42 U.S.C. §§7545(o)(1)(A), 7545(o)(1)(I)(i).

recognized as the primary pathway for decarbonizing the transportation sector. Meanwhile the global population has reached eight billion people, dramatically increasing food demand, and global carbon dioxide emissions from land use and land-use change have increased to 6.6 billion tons per year.[4]

In this Set Rule, EPA has broad discretion to set Renewable Volume Obligations (RVOs) starting in 2023 that reflect these current realities. It is unreasonable for EPA to promulgate an RFS Set Rule for 2023 through 2025 that largely continues the program as if nothing has changed and as though the RFS program has successfully been working as originally intended.

EPA should take this opportunity to adopt a new policy framework to guide the RFS program reflective of the fundamental shifts that have occurred since 2007. To allow for this necessary reassessment, we urge the Agency to finalize a Set Rule only for 2023 at this time. We also urge EPA to recognize that when biofuels are made from crops or otherwise divert the productive capacity of land, there is a "carbon opportunity cost" to not using this land either to provide food or to store carbon. This is a direct cost that needs to be factored into lifecycle analyses (LCAs) of the GHG consequences of biofuels. Due to this high cost, to avoid exacerbating the climate and other adverse environmental impacts of biofuels made from crops or other dedicated uses of land, as discussed in detail in these comments, we further urge EPA to set the RVOs for 2023 at a level that can be supplied from waste biomass and to recognize only such biofuels as qualifying to satisfy these RVOs.

II. EPA SHOULD SET THE VOLUMES FOR ONE YEAR (2023) ONLY.

In this Proposed Rule, EPA proposes to set "volume targets and applicable percentage standards for cellulosic biofuel, BBD [biomass-based diesel], advanced biofuel, and total renewable fuel for 2023-2025."[5] EPA suggests that three years is the appropriate time period for which to set the volumes in order to balance what it sees as the need to "provide the market with the certainty of demand needed for longer term business and investment plans," with the challenge of "setting volume targets too far out into the future" and the "higher uncertainty associated with projecting supply for longer time periods and the increasing likelihood for unforeseen circumstances to upset supply."[6]

We urge EPA to set volume requirements for only one year (2023) for three reasons. *First,* as EPA itself has stated, there is great uncertainty about the biofuel market, and EPA needs more time to better project market demand for biofuel production in future years. *Second*, EPA's analytical approach leaves great uncertainty about the climate and environmental impacts of biofuel production and combustion, particularly as to the impacts of the tremendous land use associated with the RFS program, and EPA must reassess these impacts with updated models and frameworks. *Third*, EPA's own analyses demonstrate that the RFS program has failed to perform as envisioned by Congress and does not achieve the goals of EISA. Limiting this rule to one year

[4] *See* IPCC, *2022: Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* 59 (2022).
[5] *See* Renewable Fuel Standard (RFS) Program: Standards for 2023-2025 and Other Changes, 87 Fed. Reg. 80582, 80583 (Dec. 30, 2022).
[6] *Id.* at 80584.

only will allow EPA time to both reconsider its analytical framework and examine additional studies on the numerous factors affecting the renewable fuels market, as well as the impacts of the RFS program, and would thus allow it to set volumes for future years with greater certainty and less climate and environmental harm.

A. There is great uncertainty related to market and other factors that will affect renewable fuel production and demand in future years.

Throughout the Proposed Rule, EPA recognizes the great uncertainty surrounding the production of and demand for renewable fuel. It notes that it is "unable to quantitatively compare all of the evaluated impacts when assessing the overall costs and impacts of this proposed rulemaking."[7] Indeed, EPA states that "[t]his proposed rule comes at a time when major policy developments and global events are affecting the transportation energy and environmental landscape in unprecedented ways."[8] Given these uncertainties, EPA acknowledges that "[s]etting percentage standards several years in advance . . . could result in less accurate gasoline and diesel projections being used in calculating the percentage standards."[9]

The inaccuracy of longer-term projections is especially acute in the renewable fuels market, which over the past two decades has experienced tremendous unpredictability. As EPA itself explains:

> [O]ur experience with the RFS program since its inception is that unforeseen market circumstances involving not only renewable fuel supply but also relevant economics mean that fuels markets are continually evolving and changing in ways that cannot be predicted. These facts affect all supply-related elements of biofuel: projections of production capacity, availability of imports, rates of consumption, availability of qualifying feedstocks, and the gasoline and diesel demand projections that provide the basis for the calculation of percentage standards. Greater uncertainty in future projections means a higher likelihood that those future projections could turn out to be inaccurate, leading to the potential need to revise them after they are established through, for instance, one of the statutory waiver provisions. Such actions to revise applicable standards after they have been set could be expected to increase market uncertainty.[10]

EPA similarly recognizes the uncertainties associated with the renewable fuel market in its draft Third Triennial Report to Congress on Biofuels and the Environment. EPA acknowledges that "the likely future effects of the RFS Program are highly uncertain," as factors

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[7] 87 Fed. Reg. at 80586.
[8] *Id*.
[9] *Id*. at 80589.
[10] *Id*. at 80591–92; *see* EPA, Draft Regulatory Impact Analysis: RFS Standards for 2023-2025 and Other Changes 5 (Dec 13, 2022) ("DRIA"), www.regulations.gov at EPA-HQ-OAR-2021-0427-0267 (explaining the many factors that lead to uncertainty in EPA's ability to set volume requirements, including, for example, "the difficulty in projecting the future market's ability to make available and consume renewable fuel").

such as "ongoing recovery from the global COVID-19 pandemic, uncertainty in the penetration of E15 in the marketplace, competition with other technologies such as electric vehicles, and continued slow growth of cellulosic ethanol production from agricultural or marginal lands" all contribute to ongoing uncertainty.[11]

In light of these real, ongoing, and significant uncertainties, EPA's ability to project volumes beyond one year become increasingly questionable. Any volumes set beyond 2023 risk artificially inflating or deflating the market depending on how these many contributing factors play out. Accordingly, EPA should focus this proposal on setting volumes for just one year.

B. EPA believes there is great uncertainty in the climate and other environmental impacts of the RFS Program, and this cautions against setting volumes beyond 2023.

Not only is there uncertainty surrounding the production of and demand for biofuels, but EPA also recognizes that its approach leaves great uncertainty around the overall climate and environmental impact of the RFS program. For this reason too, EPA should set the volumes for one year only at this time.

1. EPA needs additional time to develop its climate modeling framework and to incorporate additional studies on lifecycle GHG emissions from biofuels.

Congress made clear that in setting renewable fuel volumes, EPA must include "an analysis of . . . the impact of the production and use of renewable fuels on the environment, including on . . . climate change."[12] Below we demonstrate that EPA's current approach fails to adequately consider the full land use impact of biofuel production and offer an alternative approach. *See infra* Section IV. Given that EPA itself admits that the models it has used to analyze lifecycle emissions associated with various stages of biofuel production and use are "old, and that an updated framework is needed,"[13] EPA should set the volumes for only one year while it continues to assess and develop better approaches.

EPA explains that, rather than using admittedly outdated models for the Proposed Rule, it instead relied on "an extrapolation of lifecycle GHG analyses," using "a range of LCA estimates that are in the literature" and based on this literature review, provided "a high and low estimate of the potential GHG impacts."[14] Yet, as EPA acknowledges, "[t]he range of values in the literature for different types of renewable fuels varies considerably, particularly for crop-based biofuels," and that therefore, its "compilation of the current literature reveals a wide range of estimates of the lifecycle GHG emissions associated with renewable fuels," with particularly wide ranges for fuels made from crop-based feedstocks.[15] Thus, EPA believes there is

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[11] EPA, Biofuels and the Environment Third Triennial Report to Congress External Review Draft (ERD), at ES-4 (Jan. 2023)("Third Triennial Report").
[12] 87 Fed. Reg. at 80609.
[13] *Id.* at 80610.
[14] *Id*.
[15] *Id*. at 80610–11.

considerable "ongoing uncertainty associated with the science of analyzing biofuel GHG effects,"[16] This counsels against setting volumes for years beyond 2023.

Notably, EPA "has initiated work to develop a revised modeling framework of the GHG impacts associated with biofuels."[17] Yet it asserts that "crop-based biofuel lifecycle GHG emissions are inherently uncertain to a large degree," and it intends to use its modeling comparison exercise to "identify[] future priorities for updating and aligning particular assumptions across models," among other things.[18] And it intends to "consider the broad range of new science related to biofuel LCA, including insights from the model comparison exercise."[19] EPA indicates similar uncertainty in its Third Triennial Report to Congress.[20]

Research by the National Academies of Science, Engineering and Medicine (NAS) likewise concludes that the Agency needs new analytical approaches to determine lifecycle GHG emissions related to renewable fuel. In a recently published study entitled "Current Methods for Life Cycle Analyses of Low-Carbon Transportation Fuels in the United States," NAS notes:

> Though the study of induced land use changes from biofuels has been the topic of intense study over the last decade, substantial uncertainties remain on many key components of economic models used to assess these impacts. Further work is warranted to update these estimates of market-mediated land use change and the models so as to inform the development and implementation of an LCFS [low carbon fuel standard].[21]

EPA should thus allow additional time to incorporate this and other studies into its analysis and projections of volumes for years beyond 2023.

2. EPA's own analysis shows the needs for additional time to understand the environmental impacts of renewable fuels, including the impacts on threatened and endangered species.

In addition to EPA's uncertainty around climate impacts, so too does it express uncertainty related to other environmental impacts of the RFS program. For example, though prior litigation made clear that the RFS program may affect threatened and endangered species and thus requires consultation with Fish and Wildlife Service and National Marine Fisheries

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[16] *Id*. at 80611.
[17] *Id*. at 80610.
[18] *Id*. at 80611.
[19] DRIA at 115.
[20] *See* Third Triennial Report at 2-17–2-18, Box 2.2 (recognizing "the need to update EPA's analytical work" related to assessing the lifecycle GHG emissions from biofuel production and use, and noting that "[s]ignificant analytical work has been undertaken since EPA laid out its lifecycle methodology in the 2010 RFS rulemaking, with work in this area continuing").
[21] Nat'l Academies of Sci., Eng'g & Medicine. *Current Methods for Life Cycle Analyses of Low-Carbon Transportation Fuels in the United States*, at 10 (2022).

Service,[22] EPA has not yet completed this requisite step but rather continues to be "engaged in informal consultation including technical assistance discussions with the Services regarding this rule."[23] In its Draft Regulatory Impact Analysis, EPA notes that it "is in the process of conducting a Biological Evaluation which will evaluate impacts on endangered species from the RFS Program," and that "[m]ore information on the estimated impact to species in the affected region on the RFS program will be available when the evaluation is concluded."[24]

Similarly, in its Triennial Report to Congress, EPA notes that the impact of the RFS Program on endangered and threatened species "is unknown."[25] It admits that it has not yet estimated specific areas affected by the RFS program finer than the county level and thus "historical effects on threatened and endangered (T&E) species cannot be estimated with any reasonable degree of certainty."[26]

For all these reasons, EPA should give itself additional time to get more clarity on the climate and environmental impacts of the RFS program. It should set volumes for 2023 only so that it is able to incorporate additional studies into future volume-setting.

C. To date, the RFS has not advanced Congress's climate and environmental goals and EPA cannot justify a longer-term continuation of current RVOs.

As discussed above, through EISA, Congress intended to address the growing threat of climate change and other environmental harms associated with fossil fuels. The statute creates several measures by which Congress anticipated achieving these goals. For example, to avoid the climate and environmental harms associated with the conversion of uncultivated land – including the release of tremendous volumes of GHG and degradation of biodiversity and habitat – the statute provides that land used to grow qualifying crops must have been in cultivation at the time of the statute's passage.[27] This in turn is intended to reduce GHG emissions from the initial turning of the soil for cultivation as cropland and avoid the negative environmental impacts associated with land conversion.

In addition, the statute requires that every three years, EPA must look at "[e]nvironmental issues, including air quality, effects on hypoxia, pesticides, sediment, nutrient and pathogen levels in waters, acreage and function of waters, and soil environmental quality," as well as "[r]esource conservation issues, including soil conservation, water availability, and ecosystem health and biodiversity, including impacts on forests, grasslands, and wetlands."[28] EPA must both report to Congress about these environmental impacts and take them fully into account

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[22] *See Growth Energy et al. v. EPA*, 5 F.4th 1(D.C. Cir. 2021),
[23] 87 Fed. Reg. at 80587.
[24] DRIA at 252.
[25] Third Triennial Report at IS-4.
[26] *Id.*
[27] *See* 42 U.S.C. § 7545(o)(1)(I).
[28] 42 U.S.C. § 7545(Editorial Notes) (quoting Pub. L. 110–140, title II, §204, Dec. 19, 2007, 121 Stat. 1529).

when setting volumes,[29] including reducing volumes standards below statutory targets if implementation of those volumes will lead to severe environmental harm.[30]

Also reflected in EISA is Congress's goal to conserve resources – including (as discussed further below) land. The law amended Section 977 of the Energy Policy Act of 2005 to establish program goals to develop feedstocks "that are less resource and land intensive and that promote sustainable use of resources, including soil, water, energy, forests, and land, and ensure protection of air, water, and soil quality."[31] And it amended Section 307(d) of the Biomass Research and Development Act of 2000[32] to establish "the systematic evaluation of the impact of expanded biofuel production on the environment, including forest lands, and on the food supply for humans and animals."[33]

Despite these clear statutory goals, EPA's own analyses establish that the RFS program as implemented has not advanced the climate and environmental benefits Congress intended. As discussed above, EPA itself asserts the climate impacts of the RFS program are uncertain, and at a minimum additional studies are needed to better understand the program's effect on overall GHG emissions (and we demonstrate below that best science today indicates a significant negative impact). With more certainty, EPA acknowledges that the program has led to the conversion of millions of acres of land that was not in cultivation at the time of EISA's passage to produce corn for ethanol and soy for biodiesel, in direct contravention of Congress's intention.[34] In fact, the RFS program has "resulted in up to approximately 1.9 million acres of additional cropland between 2005 and 2016, and up to approximately 3.5 million acres of additional corn."[35] Based on EPA's recent attribution analysis, the program accounts for roughly "20% of the estimated cropland *expansion* between 2008 and 2016," and "up to 35% of the *increase* in corn acreage between 2008 and 2016."[36] And as EPA recognizes, "[c]ropland expansion often leads to increases in soil erosion, pesticide and fertilizer applications, and losses of seminatural habitat,"[37] and releases tremendous amounts of GHGs.

In addition, and partially related to the land conversion associated with growing crop-based biomass, the RFS program has led to worsening air, water, and soil quality.[38] In particular, EPA notes that "emissions for nitrogen oxides (NO_x), sulfur oxides (SO_x), carbon monoxide (CO), volatile organic compounds (VOCs), ammonia (HN_3), and particulate matter ($PM_{2.5}$) can

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[29] *Id*. § 7545(o)(2)(B)(ii).
[30] *Id*. § 7545(o)(7)(A).
[31] EISA, Pub. L. No. 110-140, § 232(a)(2)(D)(4), 121 Stat. 1492.
[32] *See* 7 U.S.C. § 8606(d).
[33] *Id.* § 232(b)(3). [1] This provision has now been moved to 7 U.S.C. § 8108.
[34] EISA defines crop-based biomass as "[p]lanted crops and crop residue harvested from agricultural land cleared or cultivated at any time prior to December 19, 2007, that is either actively managed or fallow, and nonforested," 42 U.S.C. § 7545(o)(1)(I)(i).
[35] Third Triennial Report ES-2.
[36] *Id.* ES-2–ES-3 (emphasis in original).
[37] *Id.* at ES-3.
[38] *Id.* at ES-2–ES-3, IS-4, IS-11.

be impacted at each stage of biofuel production, distribution, and usage."[39] Furthermore, EPA explains that "[r]ecent dispersion modeling has shown elevated pollutant concentrations near corn, soybean, and wood biorefineries, which were associated with adverse respiratory outcomes."[40] EPA also found that planting corn and soybeans – particularly on converted grassland – harms soil and water quality, as there is "increased chemical usage, some of which moves as runoff or leaching to surface waterways or groundwater."[41]

In sum, the RFS program has had significant negative impacts on climate and the environment. These deleterious climate and environmental impacts are directly contrary to Congress's goals in EISA and do not justify a longer-term continuation of current RVOs. EPA should therefore not set volumes beyond 2023 so it can allow itself additional time to determine how best to address these harms.

III. EPA'S PROPOSAL IS INCONSISTENT WITH THE ADMINISTRATION'S PLANS FOR TRANSPORTATION DECARBONIZATION PRIMARILY THROUGH ELECTRIFICATION, WHICH WILL REDUCE THE DEMAND FOR BIOFUEL.

EPA's proposed rule is inconsistent with the Administration's own plans and forecasts for decarbonizing the transportation sector. For this reason too, EPA should revisit the proposed RVOs and significantly reduce them.

The Administration published the *Long-Term Strategy of the United States: Pathways to Net-Zero Greenhouse Gas Emissions by 2050* in November 2021[42] and the *U.S. National Blueprint for Transportation Decarbonization* in January 2023.[43] These strategy documents, which are meant to guide the Administration's climate-related policies, point to a future in which "light-duty vehicles are almost all electric by 2050 in most scenarios."[44] This will require a

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[39] *Id.* at IS-3; DRIA at iv, Tbl. ES-1 (explaining that the volumes in the Proposed Rule will lead to "[i]ncreases in CO, NH_3, NO_x, PM_{10}, $PM_{2.5}$, SO_2, and VOC emissions associated with biorefinery production and product transport", "[h]igher ambient concentrations of NO_x, HCHO and SO_2 downwind of production facilities," and "[d]ecrease for THC, CO, and $PM_{2.5}$, but increase slightly for NO_x emissions from pre-2007 diesels running on biodiesel").

[40] DRIA at 93.

[41] DRIA at 255.

[42] *See* White House, *Long-Term Strategy of the United States: Pathways to Net-Zero Greenhouse Gas Emissions by 2050* (2021)("Long-Term Strategy"), https://www.whitehouse.gov/wp-content/uploads/2021/10/US-Long-Term-Strategy.pdf.

[43] *See* Dep't of Energy et al., *The U.S. National Blueprint for Transportation Decarbonization: A Joint Strategy to Transform Transportation* (2023)("Blueprint"), https://www.energy.gov/sites/default/files/2023-01/the-us-national-blueprint-for-transportation-decarbonization.pdf.

[44] Long-Term Strategy at 30.

continuous reduction in liquid fuel demand by passenger vehicles to zero or near zero over the next 30 years.

The *Blueprint* goes into more detail on the role of electricity versus sustainable liquid fuels for different transportation modes, noting that electrification is the best option for all light-duty passenger vehicles and most other on-road vehicles, in part to make sustainable biomass feedstocks available for the hardest to abate emissions, particularly aviation:

> [Electric Vehicles] are rapidly becoming a practical alternative for most on-road vehicle applications, with potential opportunities in other modes as well. Hydrogen fuel cell vehicles can complement battery EVs for applications requiring longer ranges and faster refueling times, like long-haul trucking. To achieve net-zero targets, sustainable fuels produced from biomass and waste feedstocks can be used to decarbonize hard-to-electrify forms of transportation such as air transport and long-haul shipping that require more energy-dense fuels. Widespread electrification of on-road vehicles will ensure that sufficient amounts of sustainable fuels are available for these harder-to-electrify applications.[45]

Electric vehicles (EVs) powered by a 100% clean electricity system can achieve a truly zero carbon road transport system without the unacceptable land-use tradeoffs inherent in relying on biofuels produced from agricultural crops. For example, the efficiency of converting sunlight into electricity through photovoltaics (PVs) (> 15% net) is about 100 times that of converting sunlight into ethanol through fermentation of corn (~0.15%). In addition, EVs convert electricity stored in their batteries into mobility about three times more efficiently than internal combustion engine vehicles (ICEVs) convert energy stored in liquid fuel into mobility, meaning that an acre of land used for photovoltaics to power electric vehicles will deliver about 300 times as much mobility as an acre of land used to grow corn for ethanol. Wind and nuclear power are even more land-efficient sources of emissions-free electricity.

The National Renewable Energy Laboratory's (NREL's) study *Examining Supply-Side Options to Achieving 100% Clean Electricity by 2035* illustrates this clearly.[46] In NREL's "All Options" scenario, electricity generation increases by about 95% from 2020 to 2035 as transportation, space heating, and other energy end uses are increasingly electrified.[47] Wind and solar supply 80% of this electricity, with wind contributing about twice as much generation as solar.[48] NREL compares the land requirements for this scenario to the land area currently devoted to corn ethanol production in their Figure 30, reproduced below, which shows that the direct land used by wind and solar to supply 80% of all electricity needed in 2035 is less than one-quarter of the land currently used to provide only 10% of the fuel used by passenger cars.[49] (The different boxes for wind reflect either the footprint of the turbines alone or the turbines and

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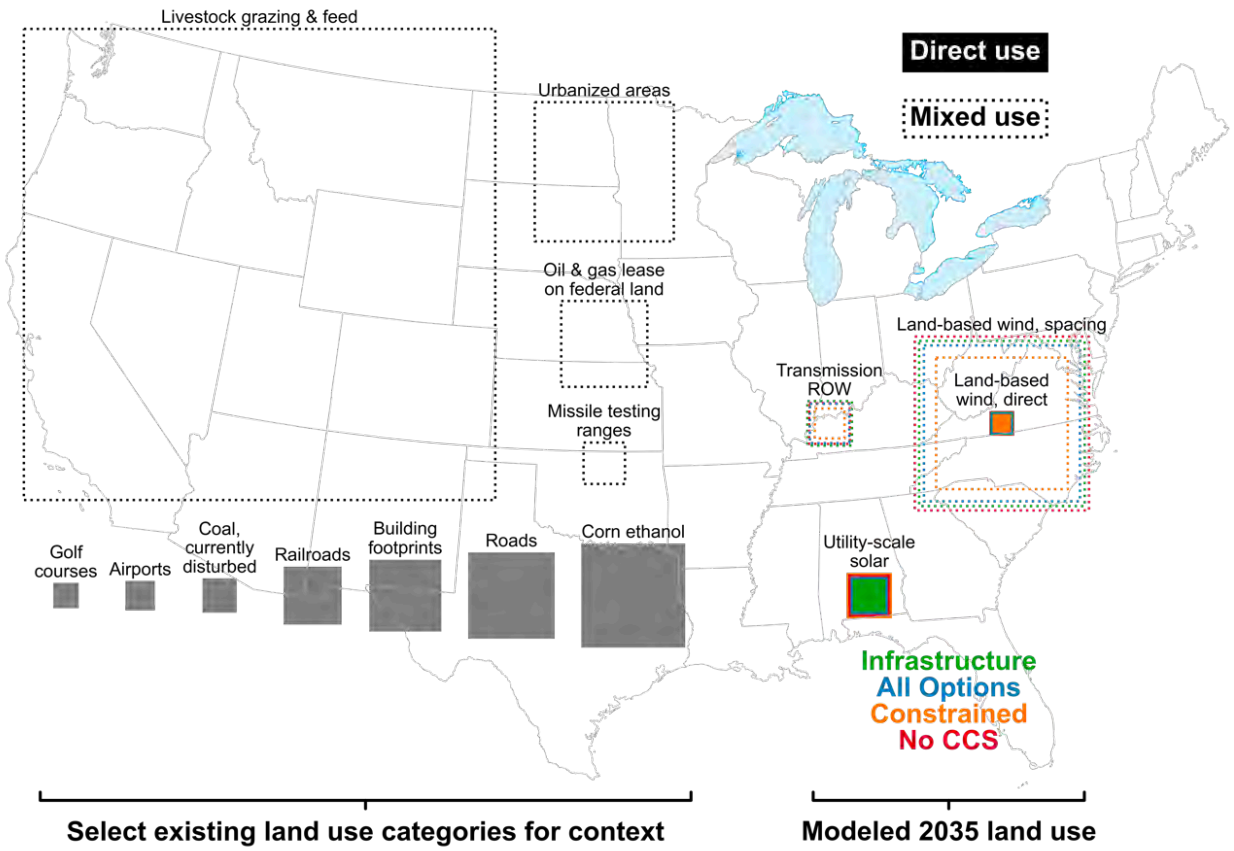
[45] Blueprint at 49.
[46] *See* Paul Denholm et al., *Examining Supply-Side Options to Achieve 100% Clean Electricity by 2035*, NREL (2022), https://www.nrel.gov/docs/fy22osti/81644.pdf.
[47] *Id*. at xi and Figure ES-1.
[48] *Id*. at 22.
[49] *Id*. at 52, Figure 30.

the land on which they are located, including spacing between turbines; in most cases most of that land between turbines will be used for other agricultural purposes.)



As noted in the *Blueprint for Transportation Decarbonization*, direct electrification is not expected to be a viable approach for eliminating emissions from aviation. While there is a great deal of uncertainty about how to decarbonize aviation, Sustainable Aviation Fuel (SAF) produced from biomass could play a role in this hard-to-abate subsector. For example, woody biomass waste and agricultural residues could be converted to aviation fuel via gasification and the Fischer-Tropsch process.[50] As we show below, however, such fuel is only likely to have a lower overall carbon footprint than petroleum-based fuel if it is derived from waste biomass that does not involve dedicated use of land. *See infra*, Section IV.

Of most importance for EPA's Proposed Rule here, EPA's proposal is predicated on *increased* use of biofuel for road transport, while the nation's *Blueprint* plans to *decrease* the use

[50] *See* M. Shahabuddin et al., *A Review on the Production of Renewable Aviation Fuels from the Gasification of Biomass and Residual Wastes*, 312 Bioresource Tech. 123596 (2020).

of biofuel for road transport. EPA must resolve this inconsistency in the final rule by reducing the volume requirements to reflect the move to electrification.

IV. EPA MUST INCLUDE THE CARBON OPPORTUNTITY COST OF USING LAND TO PRODUCE BIOFUEL FEEDSTOCK IN ITS LIFECYCLE CALCULATIONS.

Biofuels from food or energy crops are a way of using land to grow plants to replace fossil fuels, and this replacement provides a climate benefit. But this use of land is not "free" from a climate perspective. The cost of using land for biofuels includes the cost of not using that land to meet other needs. These costs must be included in any analysis of biofuels' climate impact.

For existing agricultural land, the highest cost is likely to be the lost production of food, which should be measured by the potential to save forests and other natural lands from conversion to agriculture while meeting global food needs. If agricultural land were not needed for food, the cost of using it for biofuel crops would alternatively be lost opportunities to restore forests or other habitats and sequester carbon. The full "carbon opportunity cost" of land is whichever of these costs is higher.

So long as there are other uses for land (and land area is fixed), using land for one purpose always has an opportunity cost. EPA's analytical approach underlying its Proposed Rule does not fully factor in these opportunity costs. If it did, it would become clear that the proposed RVOs for biofuels that make dedicated uses of land are not justified.

A. The cost of using land to produce feedstock for biofuel must include opportunity costs, which are the climate costs of not using land for food or to store carbon.

The intense global competition for land underlies the high "carbon opportunity cost" of land. Already roughly one quarter of the carbon humans have added to the atmosphere results from the conversion of nearly half of all vegetated land to agricultural use, and the harvest or manipulation of 60–85 percent of forests.[51]

The demand for both food and wood are rising dramatically, with population growth and increased incomes. Nearly all studies project – even after factoring in large yield increases – that global cropland area is likely to expand by one hundred to hundreds of millions of hectares

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[51] *See* Karl-Heinz Erb et al., *A Comprehensive Global 5 Min Resolution Land-Use Data Set for the Year 2000 Consistent with National Census Data*, 2 J. Land Use Sci. 191 (2007); *see also* Karl-Heinz Erb et al., *Unexpectedly Large Impact of Forest Management and Grazing on Global Vegetation Biomass*, 533 Nature 73 (2018); Priyadarshi R. Shukla et al., IPPC, Technical Report, *Climate Change and Land: An IPCC Special Report on Climate Change, Desertification, Land Degradation, Sustainable Land Management, Food Security, and Greenhouse Gas Fluxes in Terrestrial Ecosystems* (2019); Corinne Le Quéré et al., *Global Carbon Budget 2016*, 8 Earth System Sci. Data 605 (2016).

(Mha) by 2050, resulting in yet more emissions.[52] The best satellite evidence is that cropland is now expanding at a rate, if continued, that will clear an additional area the size of India by 2050.[53] Yet nearly every climate strategy consistent with the goals of the Paris climate agreement requires that the world stop expanding agricultural land more or less immediately to avoid emissions from land use change.[54]

Because global land area is fixed, every acre capable of producing plants for biofuels has a high alternative carbon value either in meeting demands for food without more land clearing or in storing carbon. As economists emphasize, any good's cost includes its "opportunity cost" – which is the loss of this alternative use. That is as true in estimating carbon costs as it is in estimating any other cost.

B. Measuring the Opportunity Cost.

The simplest way of assessing the carbon opportunity cost of using existing agricultural land for biofuels is to assess how much carbon this land could sequester if reestablished to native vegetation.[55] If land were available to divert to biofuels, it could also be used to sequester carbon

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[52] *See* David Tilman et al., *Global Food Demand and the Sustainable Intensification of Agriculture*, 108 Proceedings of the Nat'l Acad. of Scis. 202,60 (2011); *see also* David Tilman & Michael Clark, *Global Diets Link Environmental Sustainability and Human Health*, 515 Nature 518 (2014); Bojana Bajželj et al., *Importance of Food-Demand Management for Climate Mitigation*, 4 Nature Climate Change 924 (2014); Marco Springmann et al., *Options for Keeping the Food System within Environmental Limits*, 562 Nature 519 (2018); Timothy Searchinger et al., *Creating a Sustainable Food Future: A Menu of Solutions to Feed Nearly 10 Billion People by 2050*, World Res. Inst. (2019), https://www.wri.org/research/creating-sustainable-food-future; Christoph Schmitz et al., *Land-Use Change Trajectories up to 2050: Insights from a Global Agro-economic Model Comparison*, 45 Argric. Econs 69 (2014); IPPC, *Climate Change and Land: An IPCC Special Report on Climate Change, Desertification, Land Degradation, Sustainable Land Management, Food Security, and Greenhouse Gas Fluxes in Terrestrial Ecosystems* (2019).

[53] *See* Peter Potapov et al., Global Maps of Cropland Extent and Change Show Accelerated Cropland Expansion in the Twenty-First Century, 3 Nature Food 19 (2022); *see also* Timothy Searchinger et al., *EU Climate Plan Sacrifices Carbon Storage and Biodiversity for Bioenergy*, 612 Nature 27 (2022).

[54] *See* Gert-Jan Nabuurs et al., IPCC, Chapter 7: Agriculture, Forestry and Other Land Uses (AFOLU), *2022: Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* (2022); *see also* Priyadarshi R. Shukla et al., IPPC, Technical Report, *Climate Change and Land: An IPCC Special Report on Climate Change, Desertification, Land Degradation, Sustainable Land Management, Food Security, and Greenhouse Gas Fluxes in Terrestrial Ecosystems* (2019); Hans-Otto Pörtner et al., *Scientific Outcome of the IPBES-IPCC Co-Sponsored Workshop on Biodiversity and Climate Change*, IPCC & IPBES (2021).

[55] This potential should most appropriately be calculated by estimating the quantity of carbon that could be reforested in the most efficient parts of the world to do so if less food production were required. For example, if the world no longer needs 5 tons of of corn, the most efficient place to reforest might not be an acre of Iowa farm land. Instead, the most efficient use might be to continue to use that acre for food and to reforest some land elsewhere with lower crop yields and even higher reforestation potential. This potential is calculated using the "carbon gain" method in Searchinger et al. *See* Timothy D. Searchinger et

in this way. The Biden Administration has recognized such "natural climate solutions" as critical for addressing climate change.[56] Particularly because numerous governments and companies are looking to reforest land to mitigate climate change, the availability of land is the key limiting constraint.[57]

This foregone carbon sequestration potential would be the appropriate measure if the need for agricultural land were declining. It is therefore a minimum carbon opportunity cost. Nothing in the EPA methodology factors in this cost.

So long as the world continues to expand agricultural land, the highest value of crops and cropland will typically be not its reforestation value but continuing to produce food because of the potential that creates to avoid land conversion elsewhere. The cost of this foregone food production is the carbon cost of using other land to replace that food. Use of economic models to estimate the costs of "indirect land use change" (ILUC) is one method of assigning *some* cost to this foregone food production, but this method does not measure the true, full cost. It is also inconsistent with how EPA measures the climate costs of virtually every other product, including gasoline.

The way to estimate the climate cost of devoting crops or cropland to biofuels, is the same way lifecycle calculations estimate the climate costs of everything else, and is usually based on the average costs of producing it. They include the initial investment or cost of the production infrastructure (including cropland) and second, the continued costs of producing the goods (growing the crops).

For example, making manufactured goods requires first making a factory. When the emissions of making a factory are significant, these emissions must be allocated proportionately to the climate costs of producing each good.[58] Similarly, making crops requires first "making" cropland, which causes carbon emissions from clearing vegetation and by disturbing soils. Because these costs of "making cropland" are a large portion of the emissions of making crops to

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al., *Assessing the Efficiency of Changes in Land Use for Mitigating Climate Change*, 564 Nature 249 (2018).

[56] *See* White House Council on Env't Quality et al., *Accelerate Nature-Based Solutions: A Roadmap for Climate Progress, Thriving Nature, Equity, & Prospecty: A Report to the National Climate Task Force* (2022), https://www.whitehouse.gov/wp-content/uploads/2022/11/Nature-Based-Solutions-Roadmap.pdf.

[57] *See* Keith K. Dooley et al., *The Land Gap Report* (2022), https://www.landgap.org/wp-content/uploads/2022/11/Land-Gap-Report_FINAL.pdf.

[58] *See* Greenhouse Gas Protocol, *Product Life Cycle Accounting and Reporting Standard*, https://ghgprotocol.org/sites/default/files/standards/Product-Life-Cycle-Accounting-Reporting-Standard_041613.pdf.

be used for biofuels, [59] these costs must be included in a calculation of the total climate impact of biofuel production.

Whether for agricultural land or for a factory, the costs of making them have already occurred, but the reason to assign these costs to crops or to any good is because they are also part of the cost of making an additional unit of them. The guiding assumption in lifecycle analyses is that the consumption of one additional unit of product, whether an additional car or an additional ton of a crop, will require additional production of one unit. In the absence of strong information that the marginal costs of new production will be different, this is usually estimated by the average cost of existing production. (For example, if a baseball is consumed, lifecycle calculations do not use a global, economy-wide economic model to ask how many baseballs will be replaced or how the whole economy will be influenced, but rather they estimate the average costs of making the baseball.) For cropland used to produce ethanol, in a world with increasing cropland, ethanol emissions should factor in the average carbon cost of producing that cropland.[60]

It is no more appropriate to use an economic model to estimate the climate costs of biofuels, and of the cropland used to produce them, than it is to estimate the climate costs of making and driving a car, or the emissions of mercury from electricity production. (This statement would remain true even if the models could overcome the enormous challenges, some discussed by EPA, to doing this type of economic modeling accurately.) These ILUC methods do not examine the full cost because they do not examine what alternatively *could* be done with land (nearly always with the same or less financial cost) and because they confuse the costs of producing biofuels with the climate effects of a variety of other social welfare effects.

One example is the role that reduced food consumption plays in reducing ILUC estimates in some models. For example, both the FAPRI model EPA used to evaluate corn ethanol in its first rulemaking, and the GTAP model used by California, estimated low ILUC in part because they claimed higher food prices caused by biofuels would cause people around the world to consume less food. [61] As a result, one quarter of the food in the EPA model, and one half in the California model, would not be replaced (independent of by-product effects). If food is not replaced, of course, you don't need to convert other land, so this estimated reduced consumption was a major source of the low ILUC. But this calculation does not estimate the actual climate costs of producing crops (and devoting land) to biofuels. Instead, this method just subtracts from this cost, the claimed climate "benefit" of reduced food production by others, who are primarily the world's poor.

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[59] *See* Kurt Schmidinger & Elke Stehfest, *Including CO2 Implications of Land Occupation in LCAs—Method and Example for Livestock Products*, 17 Int'l J. Life Cycle Assessment 962 (2012); *see also* Matthew N. Hayek et al., *The Carbon Opportunity Cost of Animal-Sourced Food Production on Land* , 4 Natures Sustainability 21 (2021); *See* Timothy D. Searchinger et al., *Assessing the Efficiency of Changes in Land Use for Mitigating Climate Change*, 564 Nature 249 (2018).

[60] *See* Timothy D. Searchinger et al., *Assessing the Efficiency of Changes in Land Use for Mitigating Climate Change*, 564 Nature 249 (2018).

[61] *See* Timothy Searchinger et al., *Do Biofuel Policies Seek to Cut Emissions by Cutting Food?*, 347 Sci. 1420 (2015).

These kinds of effects are also not morally defensible ways of reducing emissions because they come with high social costs. They would ultimately also harm the climate because governments tend to build roads or otherwise support clearing of land to grow more food when prices are high enough to effect consumption, which are effects that are not and cannot realistically be modeled.

Moreover, the use of economic modeling by EPA and others has also been inconsistent, leading to biased estimates. If the EPA relies on economic "rebound" effects to claim that 1 gallon of ethanol will not lead to 1 gallon's worth of additional crops, it also needs to factor in rebound effects that suggest the ethanol will not reduce gasoline consumption by 1 gallon either. Absent other policies, common estimates are that for each gallon of gasoline displaced, other consumers will increase gasoline use by one quarter to half a gallon.[62] If one gallon of ethanol only requires the emissions of replacing one half to three quarters of the crops, it also saves only half to three quarters of the emissions from gasoline use.

Use of economic models, if reliable, can be appropriate for a full analysis of social welfare effects but not to claim that a gallon of gasoline (or ethanol) does not generate a gallon's worth of emissions. Unlike an ILUC analysis, a full social-welfare analysis would not treat reduced food consumption due to higher food prices as a benefit because it would also factor in the social welfare cost. When just analyzing the emissions of ethanol or gasoline or any other products, the emissions should be based on those involved in producing them (including the carbon lost by turning land into cropland and by keeping it in that use).

In a perfect global carbon pricing system, the cost of biofuels would reflect the carbon opportunity costs as described, and the purpose of lifecycle calculations is to achieve the same result.[63] Like the costs of making a factory, these costs are a direct, not indirect, cost of biofuel production. Because any rational government policy to address climate change must deploy its resources, including land, where they do the most good, excluding these opportunity costs undermines rational efforts to address climate change.

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[62] *See* Jason Hill et al., *Climate Consequences of Low-carbon Fuels: The United States Renewable Fuel Standard*, 97 Energy Pol'y 351 (2016).

[63] The need to factor the opportunity cost of land final into lifecycle calculations can be seen by comparison to a perfect global carbon pricing system widely recognized as the theoretical, if not yet achievable, way of ensuring that all human activities reflect their carbon costs. In such a system, the same carbon price charged for all energy emissions would also be charged to the loss of carbon from land and would be rewarded to uses of land to sequester carbon. In such a system, land would only be diverted to biofuel production if and to the extent its climate benefits exceeded the value of using this land to maintain or sequester carbon, or to produce food, so other land could maintain carbon. Those are the opportunity costs discussed here. Because the world lacks such a perfect global carbon pricing system system, lifecycle analyses are the necessary tools EPA must use to evaluate the greenhouse gas costs of biofuels. But this analogy explains why to get the accounting right, lifecycle calculations must also factor in the carbon opportunity cost of land.

V. BECAUSE THE CARBON OPPORTUNITY COSTS OF DEDICATING LAND TO MAKING BIOFUELS IS HIGH, EPA SHOULD NOT ENCOURAGE ANY BIOFUELS THAT DIVERT THE PRODUCTIVE CAPACITY OF LAND FROM OTHER USES.

The carbon opportunity costs of devoting land to produce biofuels from crops or that otherwise divert the productive capacity of land are likely to exceed the displaced fossil fuel emissions. That is true even if there were no low-carbon alternative to fossil energy. Because there are now much more efficient alternatives, the opportunity cost of devoting land to biofuels is actually hundreds of times the benefits. For these reasons, these types of biofuels should not be encouraged.

Carbon opportunity costs if there are no low-carbon non-fossil fuel alternatives: As Table 1 shows, for corn ethanol, the average carbon cost of land is roughly double the emissions saved from fossil fuels, and for vegetable oil-based biodiesel, the cost is 3-4 times higher. (Using a global cost is appropriate because the close integration of the U.S. into international markets means that crop price changes in the U.S. caused by biofuels are reflected internationally.[64]) Factoring in production emissions for both gasoline and ethanol increases makes the comparison even more disadvantageous.[65]

Even if the world had surplus land, the carbon opportunity cost of not reforesting land is far higher than the benefit of displacing fossil fuels with biofuels from food or energy crops.[66] In fact, even assuming cellulosic ethanol could be produced on surplus "non-cropland," biofuels would be adverse relative to reforesting land even at several times the average yields achieved from energy crop grasses today.[67] And even if cellulosic ethanol were to achieve extraordinary yields in the future, the percentage savings of the resulting biofuels relative to fossil fuels would

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[64] *See* Michael J. Roberts & Wolfram Schlenker, *Identifying Supply and Demand Elasticities of Agricultural Commodities: Implications for the US Ethanol Mandate*, 103 Am. Econ. Rev. 2265 (2013).
[65] Moreover, even if the carbon opportunity costs were calculated half based on the U.S. only and half at the global level, the authors of the above numbers have calculated that the land use costs of corn ethanol are reduced only to 120 gCO2/MJ and soybean-based vegetable oil only to 235 gCO2/MJ (personal communication Stefan Wirsenius).
[66] *See* Renton Righelato & Dominik V. Spracklen, *Environment. Carbon mitigation by **b**iofuels or by Saving and Restoring Forests?*, 317 Sci. 1066 (2007); *see also* Samuel G. Evans et al,. *Greenhouse Gas Mitigation on Marginal Land: A Quantitative Review of the Relative Benefits of Forest Recovery versus Biofuel Production*, 49 Env't Sci & Tech. 2503 (2015); Timothy Searchinger et al., *Does the World Have Low-carbon Bioenergy Potential from the Dedicated Use of Land?*, 110 Energy Pol'y 434 (2017).
[67] *See* Samuel G. Evans et al,. *Greenhouse Gas Mitigation on Marginal Land: A Quantitative Review of the Relative Benefits of Forest Recovery versus Biofuel Production*, 49 Env't Sci & Tech. 2503 (2015); *see also* Timothy Searchinger et al., *Does the World Have Low-carbon Bioenergy Potential from the Dedicated Use of Land?*, 110 Energy Pol'y 434 (2017).

be modest and far from the near 100% reductions needed from the mitigation of fossil fuels to address climate change.[68]

Table 1: Global Carbon Opportunity Costs of Various Crop-Based Biofuels gCO_2/MJ[69]

Corn ethanol	160	Soy biodiesel	330
Wheat ethanol	123	Palm biodiesel	260
Sugarcane ethanol	93	Rapeseed biodiesel	270
Comparison tailpipe emissions:			
Gasoline	74	Diesel	81

For the same reasons, EPA should not provide RFS credits for biofuels based on wood harvested for this purpose or used to make electricity that in turn is used for biofuels. The opportunity cost of not harvesting wood is allowing this wood to stay in a forest. Numerous

[68] For example, Evans et al. (2015) estimated that with high conversion efficiencies and grass yields of 25.5 tons per hectare, cellulosic ethanol over 30 years would achieve a 10% higher mitigation advantage over reforestation. And that yield is four times the average yield for switchgrass in the United States found in a 2017 study of 6.3 tons per hectare per year. *See* John H. Fike et al., *Switchgrass Nitrogen Response and Estimated Production Costs on Diverse Sites*, 9 GCB Bioenergy 1526 (2017).

[69] *See* Timothy D. Searchinger et al., *Assessing the Efficiency of Changes in Land Use for Mitigating Climate Change*, 564 Nature 249, at Supplementary Tbl. 4 (2018). As explained in this Searchinger et al. (2018) and supporting information, this calculation starts by estimating the carbon lost from terrestrial vegetation and soils used to produce each crop that is the biofuel feedstock. It divides this by the global production of that crop to obtain a carbon loss per ton. It then discounts this carbon loss using an approach that produces a result similar to EPA's policy of amortizing land use emissions over 30 years of biofuel production. This generates the "carbon opportunity cost" per ton of each crop. To estimate the portion that goes into a mega joule of the biofuel, it estimates the quantity of each crop required after generously excluding a portion of the crop, and therefore the carbon opportunity cost, that can be attributed to co-products or by-products.

studies have found that harvesting and using wood for electricity from virtually any forest or using any harvesting regime generates higher emissions for decades than even using coal, and yet even more than using natural gas. *See* papers cited in Appendix A.

Carbon opportunity costs in light of solar/electric vehicle alternatives: Because, as the Biden Administration has acknowledged, the viable and cheaper alternative to gasoline and diesel is electric cars fueled by solar panels or wind, the true land use opportunity costs of biofuels are hundreds of times higher than fossil fuels.

The reason is that even on highly productive land – which is the most efficient land for producing biofuels but does not increase the efficiency of solar cells – biofuels require far more land than solar cells to produce the same quantity of useable energy in the fuel. The useable energy produced on Iowa land for corn ethanol is only 1/100th that of even the solar cells available five-years ago.[70] Even in the U.S. location with the highest estimated potential future switchgrass yields estimated by the U.S. DOE, the land use efficiency of cellulosic ethanol would only reach 2% of the efficiency of even older solar cells. Globally, using optimistic assumptions for future cellulosic ethanol, and comparing it to solar cells available today, an acre of PV would produce at least 100 times more useable energy on 75% of the world's land. When combined with the nearly three times higher efficiency of electric engines than fossil engines, the relative land efficiency rises three-fold more.[71]

As discussed above, a single hectare of reforestation has at least the same GHG mitigation as even high-yielding cellulosic ethanol and mitigates far more than corn ethanol or soybean biodiesel.[72] In effect, therefore, if instead of devoting 300 hectares of land to biofuels, the world devoted one hectare to solar cells and 299 to reforestation, the world would generate the same replacement of fossil fuels and achieve at least 300 times the overall climate mitigation.

Put simply, the world has a vital need to use productive land for food and for forests and other habitats that store carbon. Because it has far better alternatives to devoting land to biofuels, the climate costs of devoting land to biofuels are hundreds of times the savings.

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[70] *See* Timothy Searchinger et al., *Does the World Have Low-carbon Bioenergy Potential from the Dedicated Use of Land?*, 110 Energy Pol'y 434 (2017). This reference provides all figures in this paragraph.

[71] Even if fossil fuels are used to make the car batteries, the net efficiency rises by a factor of 1.5 to 2, but the production of batteries even now has started to utilize solar power. *See* Timothy Searchinger et al., *Does the World Have Low-carbon Bioenergy Potential from the Dedicated Use of Land?*, 110 Energy Pol'y 434 (2017).

[72] *See* Renton Righelato & Dominik V. Spracklen, *Environment. Carbon mitigation by **b**iofuels or by Saving and Restoring Forests?*, 317 Sci. 1066 (2007); *see also* Joseph E. Fargione et al., *Natural Climate Solutions for the United States*, 4 Sci. Advances eaat1869 (2008); Timothy Searchinger et al., *Does the World Have Low-carbon Bioenergy Potential from the Dedicated Use of Land?*, 110 Energy Pol'y 434 (2017).

VI. BIODIVERSITY AND OTHER HIGH ENVIRONMENTAL COSTS ALSO MAKE IT EXCESSIVELY COSTLY TO DEVOTE LAND TO BIOFUEL PRODUCTION.

The evaluation of the RFS2, according to statute, must also consider non-climate effects "on the environment" as well, specifically including "conversion of wetlands, ecosystems, wildlife habitats." Because the effects of biofuels that make dedicated uses of land are, if anything, even more adverse to these environmental values than carbon, EPA should also refuse to authorize credits for these kinds of biofuels on the basis of these harms.

Primarily due to agriculture, the world has lost 35 percent of its forests and for various products, is heavily manipulating two thirds of what remain.[73] It has also converted or heavily transformed more than 90 percent of its native grasslands and more than 80 percent of its shrublands.[74] The rate of loss has also accelerated. Just between 1990 and 2020, global forest area declined by 420 million hectares (Mha), or roughly 10 percent. That 1990–2020 forest loss included 81 Mha of primary forests, which the Food and Agriculture Organization of the United Nations (FAO) defines as forests with little sign of human impact.[75]

There is broad agreement that the main driver of biodiversity loss has been these physical transformations of habitat.[76] There is also scientific agreement that ongoing land-use change accordingly poses grave threats to remaining biodiversity. A major UN report recently found that 1 million species are threatened with extinction,[77] a rate of extinction now being called Earth's sixth mass extinction event.[78] One recent paper found that 80 percent of all threatened terrestrial bird and mammal species are imperiled by agriculture-driven habitat loss.[79]

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[73] *See* James E. M. Watson et al., *The Exceptional Value of Intact Forest Ecosystems*, 2 Nature Ecology & Evolution *599* (2018); *see also* Priyadarshi R. Shukla et al., IPPC, Technical Report, *Climate Change and Land: An IPCC Special Report on Climate Change, Desertification, Land Degradation, Sustainable Land Management, Food Security, and Greenhouse Gas Fluxes in Terrestrial Ecosystems* (2019).

[74] *See* Priyadarshi R. Shukla et al., IPPC, Technical Report, *Climate Change and Land: An IPCC Special Report on Climate Change, Desertification, Land Degradation, Sustainable Land Management, Food Security, and Greenhouse Gas Fluxes in Terrestrial Ecosystems* (2019); *see also* Erle C. Ellis et al., *Anthropogenic Transformation of the Biomes, 1700 to 2000*, 19 Global Ecology & Biogeography *589* (2010).

[75] *See* Food & Agric. Org. of the U.N,, Rome, *Global Forest Resources Assessment 2020 Main Report* (2020), https://www.fao.org/3/ca9825en/ca9825en.pdf.

[76] *See* IPBES, *Summary for Policymakers of the Global Assessment Report on Biodiversity and Ecosystem Services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Service* (2019); *see also* S.L. Pimm et al., *The Biodiversity of Species and Their Rates of Extinction, Distribution, and Protection*, 344 Sci. 124,6752 (2014).

[77] *See* IPBES, *Summary for Policymakers of the Global Assessment Report on Biodiversity and Ecosystem Services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Service* (2019).

[78] *See* Gerardo Ceballos et al,. *Accelerated Modern Human–Induced Species Losses: Entering the Sixth Mass Extinction*, 1 Sci. Advances e1400253 (2015).

[79] *See* David Tilman et al., *Future Threats to Biodiversity and Pathways to Their Prevention*, 546 Nature 73 (2017).

Another paper found that bird species with impending extinctions due to land-use activities ranged from 74 to 121 in 2011 (depending on the conservativeness of the estimate), which could nearly double the 140 bird species estimated to have been lost since the year 1500.[80] The loss of plant and insect species is even more directly attributable to land conversion.

The biodiversity consequences of ongoing conversion of savannas can rival that of the conversion of forests. The tallgrass prairies of the United States, which once typically harbored 300 more grass and herbaceous species per hectare, have been almost completely eliminated.[81] When replaced with pasture, typically only 1 or 2 grass species are present. The result has been large declines in grassland bird species and vast numbers of insect species, many of which we will never know about. The Brazilian Cerrado is one of the world's most biologically diverse ecosystems with more than 12,000 species of plants, of which 4,400 are found nowhere else.[82] Most of the native Cerrado has been converted to agricultural use,[83] including pasture that uses a single African grass species.

In the United States, agricultural expansion is threatening biodiversity in the Great Plains, which have retained significant areas of mid-grass prairie. But millions of acres per year are being rapidly lost to cropland conversion, with great cost to plant biodiversity, rare birds and others.[84] For example, the six endemic songbirds to the Great Plains have lost from two-thirds to 94% of their populations since the 1960s.[85] A recent study found that from 2006 to 2016—a period which corresponds with rapid increases in U.S. corn ethanol—the rate of cropland expansion in the Western corn belt tripled compared to the period 1980–2005.[86]

Because of climate change and other threats, preserving biodiversity requires not only avoiding agricultural expansion and preserving habitats, but also restoring habitats. A comprehensive UN study found that not only does habitat loss threaten extinctions, but without

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[80] *See* Alexandra Marques et al., *Increasing Impacts of Land Use on Biodiversity and Carbon Sequestration Driven by Population and Economic Growth*, 3 Nature Ecology & Evolution 628 (2019).
[81] *See* David S. Wilcove, *The Condor's Shadow: The Loss and Recovery of Wildlife in America* (2000).
[82] *See* Juan F. Silva et al., *Spatial Heterogeneity, Land Use and Conservation in the Cerrado Region of Brazil*, 33 J. Biogeography 536 (2006).
[83] *See* V. De Sy et al., *Land Use Patterns and Related Carbon Losses Following Deforestation in South America*, 10 Env't Rsch. Letters 124,004 (2015).
[84] *See* World Wildlife Fund, *Plowprint* (2017), https://files.worldwildlife.org/wwfcmsprod/files/Publication/file/75nqs69p1_plowprint_AnnualReport_2017_revWEB_FINAL.pdf?_ga=2.217137939.446957529.1675923727-663665490.1675923727; *see also* Tyler J. Lark et al., *Cropland Expansion Outpaces Agricultural and Biofuel Policies in the United States*, 10 Env't Rsch. Letters 1 (2015).
[85] *See* World Wildlife Fund, *Plowprint* (2017), https://files.worldwildlife.org/wwfcmsprod/files/Publication/file/75nqs69p1_plowprint_AnnualReport_2017_revWEB_FINAL.pdf?_ga=2.217137939.446957529.1675923727-663665490.1675923727.
[86] *See* Chaoqun Lu et al., *Increasing Carbon Footprint of Grain Crop Production in the US Western Corn Belt*, 13 Env't Rsch. Letters 124,007 (2018).

habitat restoration, 500,000 species are likely to go extinct.[87] Key landscapes are at a breaking point. For example, scientists believe that the Amazon rain forest is at a tipping point. Additional clearing of forest is likely to reduce the Amazon's internal generation of clouds and rainwater necessary for it to remain a rain forest.[88] If deforestation continues at present rates for even 10 more years, the Amazon could inexorably transform into a savanna, losing much of its present biodiversity and carbon.

Biofuels that make dedicated uses of land leave less land for habitat. The effects are large. For example, the dominant sources of global vegetable oil are soybeans and palm oil, the growth of biodiesel is responsible for one third of the growth in demand for vegetable oil in the last decades and roughly 60% in the last six years,[89] and both crops are drivers of habitat loss in the U.S. and outside.[90] To avoid severe impacts on biodiversity, EPA should not make biofuels that make dedicated uses of land eligible for meeting RFS targets.

VII. AMERICAN FARMERS HAVE GREAT DEMANDS FOR THEIR CORN AND OTHER CROPS EVEN WITHOUT BIOFUELS.

EPA need not be concerned that phasing out the use of land for biofuels will leave American farmers without markets for their products. Even without biofuels, virtually all analyses estimate that the demand for crops will grow by at least 50% between 2010 and 2050. Corn and other feed crops are particularly in demand because of expected 60-100% increases in

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[87] *See* IPBES, *Summary for Policymakers of the Global Assessment Report on Biodiversity and Ecosystem Services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Service* (2019).
[88] *See* Armineh Barkhordarian et al., *A Recent Systematic Increase in Vapor Pressure Deficit over Tropical South America*, 9 Sci. Reps. 153 (2019); *see also* Thomas Lovejoy & Carlos Nobre, *Amazon Tipping Point: Last Chance for Action*, 5 Sci. Advances eaba2949 (2019).
[89] *See* Chris Malins, *Biofuel to the Fire – The Impact of Continued Expansion of Palm and Soy Oil Demand through Biofuel Policy*, Rainforest Found. Nor. (2020), http://www.circulareconomy.lt/wp-content/uploads/2020/03/RF_report_biofuel_0320_eng_SP.pdf; Hannah Ritchie & Max Roser, *Soy*, Our World in Data (2021), https://ourworldindata.org/soy; Additional calculations by Chris Malins.
[90] *See* Mikaela Weisse & Elizabeth Dow Goldman, *Just 7 Commodities Replaced an Area of Forest Twice the Size of Germany Between 2001 and 2015*, World Res. Inst. (2021), https://www.wri.org/insights/just-7-commodities-replaced-area-forest-twice-size-germany-between-2001-and-2015; *see also* Tyler J. Lark et al., *Cropland Expansion in the United States Produces Marginal Yields at High Costs to Wildlife*, 11 Nature Commc'ns 4295 (2020).

this time-frame for meat and milk.[91] All trend lines suggest that corn and soybean demand will continue to increase, providing large markets for U.S. farmers.[92]

For the world to stop clearing land, it is vital that wealthier countries, such as the United States and countries in Europe, stabilize or reduce their own demands for agricultural products so that they can contribute food to meeting rising global demands.[93]

VIII. EPA SHOULD ESTABLISH RENEWABLE VOLUME OBLIGATIONS THAT CAN BE MET USING WASTE BIOMASS.

As discussed above, electrification should be the focus of policies to decarbonize transportation and any use of dedicated land to produce biofuels is likely to exacerbate, rather than ameliorate, climate change, biodiversity loss, and food insecurity. Given EPA's statutory requirement to consider these factors, EPA should not set RVOs that it expects to be met by dedicating millions of acres of arable land to fuel production. EPA's proposal fails this test.

The Draft Regulatory Impact Analysis (DRIA) provides EPA's assessment of the production volumes and feedstocks it expects will be supplied to the U.S. market. For 2023, EPA projects: 0 gallons of liquid cellulosic biofuel (Table 6.1.2-3); 719 million ethanol-equivalent gallons of CNG/LNG derived from biogas, which comes from waste (Table 6.1.3-2); 0 eRINs; 3600 million gallons of biomass based diesel (BBD), of which 1010 million gallons comes from waste fats, oils, and greases (FOG) and 320 million gallons comes from distillers corn oil (DCO), both of which can be considered waste biomass, although some backfilling with crops from dedicated lands would likely be required to replace them in animal feed (Table 6.2.5-2); 110 million gallons of imported sugarcane ethanol, all of which requires dedicated land to produce (p. 368); 146 million gallons of other (non-cellulosic) advanced biofuel, including 26 million gallons of domestic advanced ethanol, and with the amount of other advanced biofuel coming from wastes unspecified in the DRIA (p. 369); 14.5 billion gallons of corn ethanol, all of which requires the dedicated use of land (Table 6.6-1).

Based on the share of these projected volumes from waste biomass, and generously including the 146 million gallons of other advanced biofuels with unspecified feedstocks, we urge EPA to set RVOs for 2023 of no more than 719 million gallons of cellulosic biofuel; 1330

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[91] *See* David Tilman & Michael Clark, *Global Diets Link Environmental Sustainability and Human Health*, 515 Nature 518 (2014); *see also* Bojana Bajželj et al., *Importance of Food-Demand Management for Climate Mitigation*, 4 Nature Climate Change 924 (2014); Timothy Searchinger et al., *Creating a Sustainable Food Future: A Menu of Solutions to Feed Nearly 10 Billion People by 2050*, World Res. Inst. (2019), https://www.wri.org/research/creating-sustainable-food-future; Hugo Valin et al., *The Future of Food Demand: Understanding Differences in Global Economic Models*, 45 Agric. Econ. 51 (2014).

[92] *See* Olaf Erenstein et al., *Global Maize Production, Consumption and Trade: Trends and R&D Implications*, 14 Food Security 1295 (2022); *see also* Hannah Ritchie & Max Roser, *Soy*, Our World in Data (2021), https://ourworldindata.org/soy.

[93] *See* Timothy Searchinger et al., *EU Climate Plan Sacrifices Carbon Storage and Biodiversity for Bioenergy*, 612 Nature 27 (2022).

million gallons of BBD, 2195 million gallons of total advanced biofuels and 2195 million gallons of total biofuel.

While these RVOs are dramatically lower than those proposed by EPA (see Table 2 below), actual biofuel production is likely to be much closer to EPA's proposal as it is expected to continue to be cost-effective to blend 10% ethanol into gasoline. EPA estimates that this 10% blend wall would allow for 13.9 billion gallons of ethanol consumption in 2023. Hence, if EPA promulgated these RVOs we expect total biofuel consumption to be 16.1 billion gallons in 2023. Note that were EPA to finalize RVOs that require more use of conventional biofuel than can be accommodated within the 10% blend wall the primary effect would be to induce more biodiesel production from soybeans or other crops, which are both much more expensive and have a much higher carbon opportunity cost than corn ethanol.

Table 2

RVO Category	**EPA Proposal (million gallons equivalent)**	**WRI & Earthjustice Proposal (million gallons equivalent)**
Cellulosic biofuel	719	719
Bio-Based Diesel	3,600	1,330
Total Advanced Biofuel	5,819	2,195
Total Biofuel	20,819	2,195

CONCLUSION

For the foregoing reasons, we urge EPA to finalize a Set Rule only for 2023 at this time, and to set the RVOs for 2023 at a level that can be supplied from waste biomass and to recognize only such biofuels as qualifying to satisfy these RVOs.

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Appendix A

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Environmental Justice
In California's Lithium Valley

Understanding the potential impacts of direct lithium extraction from geothermal brine.

A document for community education

NOVEMBER 2023

EARTHWORKS

COMITE CIVICO DEL VALLE, INC.

Environmental Justice
In California's Lithium Valley

Understanding the potential impacts of direct lithium extraction from geothermal brine.

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November 2023

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ABOUT COMITE CIVICO DEL VALLE

Comite Civico del Valle (CCV) was founded on the principle that "Informed People Build Healthy Communities" and continues to incorporate this in all partnerships, research, and civic engagement taken by our organization. CCV is a 501 (c)(3) organization with an extensive background and accomplishments that date back to our grassroots origins in 1987. Our organization was founded in Imperial County, California with the endeavor of improving the lives of disadvantaged communities by informing, educating, and engaging the community's civic participation.

CCV is a member of the Lithium Valley Community Coalition (LVCC). The LVCC is a coalition of various organizations that represent disinvested communities, rural neighborhoods, organized labor, environmental justice, and people across the Imperial Valley standing up for a just and equitable Lithium Valley future. The LVCC envisions a region with an abundance of economic opportunities for historically disadvantaged communities, with a focus on doing no harm to the environment while advancing California's ambitious climate goals. The LVCC undertakes a task to meet the needs of the communities located in Lithium Valley in an equitable, environmentally friendly, and community-conscious manner. LVCC's goal is to ensure that disadvantaged communities can be represented in an equitable manner and have a seat at the decision-making table.

ABOUT EARTHWORKS

Earthworks is a nonprofit organization dedicated to protecting communities and the environment from the adverse impacts of mineral and energy development while promoting sustainable solutions. We work with communities and grassroots groups to reform government policies, improve corporate practices, influence investment decisions, and encourage responsible materials sourcing and consumption. We expose and aim to prevent the health, environmental, economic, social, and cultural impacts of mining and energy extraction through work informed by sound science.

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Founded in Imperial County, California on the principle that "Informed People Build Healthy Communities" with the endeavor of improving the lives of disadvantaged communities, informing, educating, and engaging the community's civic participation.

Read online at
earthworks.org/lithium-valley

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Glossary

BHER	**Berkshire Hathaway Energy Renewables** Company that operates ten existing geothermal plants in Imperial Valley and is piloting lithium extraction technology.
CEQA	**California Environmental Quality Act** California law that requires public agencies and local governments to evaluate and disclose the environmental impacts of development projects.
CTR	**Controlled Thermal Resources** Company proposing to build the Hell's Kitchen geothermal power plant and lithium extraction facility in Imperial Valley.
DLE	**Direct Lithium Extraction** Type of extraction proposed in Imperial Valley that uses a chemical or physical process to remove lithium from brine.
EIR	**Environmental Impact Report** A report that analyzes a proposed project's impacts on the environment and outlines ways to avoid or minimize impacts.
EGS	**Enhanced Geothermal System** A technique for drilling geothermal wells by injecting pressurized fluid, similar to fracking.
EPA	**Environmental Protection Agency** United States government agency tasked with environmental protection.
ESM	**ES Minerals / EnergySource Minerals** Company planning to build a lithium extraction facility at the John L. Featherstone (Hudson Ranch 1) Power Plant.
EV	**Electric Vehicle** Vehicle powered by an electric motor that draws energy from a battery.
FPIC	**Free, Prior, and Informed Consent** Internationally recognized right of Indigenous peoples regarding projects affecting their lands, territories, resources, and cultural heritage. Includes the right to say "no" to a project.
Geothermal Plant	Power plant that draws heat from the earth to produce low-carbon electricity.
HCl	**Hydrochloric Acid** Hazardous material used in the lithium extraction process.
ICAPCD	**Imperial County Air Pollution Control District** Imperial County agency that sets air quality standards and mitigation requirements for development projects.

IID	**Imperial Irrigation District** Irrigation district and utility that provides water to Imperial Valley, including to proposed lithium projects.
ILiAD	**Integrated Lithium Adsorption Desorption** Proprietary technology that EnergySource Minerals plans to use for extracting lithium from geothermal brine.
ILO	**International Labor Organization** United Nations agency that sets labor standards for advancing social and economic justice.
LCE	**Lithium Carbonate Equivalent** Standard to compare the amount of battery-grade lithium a deposit can produce, assuming 100% recovery.
LVC	**Lithium Valley Commission** Commission tasked with analyzing the potential for lithium extraction in California and making recommendations to the state legislature.
MW	**Megawatts** A unit of power equal to one million watts, used to measure the output of power plants.
PEIR	**Programmatic Environmental Impact Report** A report that analyzes the cumulative environmental impacts of a land use plan that includes multiple proposed projects, rather than project by project.
PM	**Particulate Matter** Small particles, such as dust, that contribute to air pollution and are harmful to human health.
Salar	**Salt Flat** A salt flat where lithium can often be found dissolved in brine
SSKGRA	**Salton Sea Known Geothermal Resource Area** The area on the south shore of the Salton Sea that is known to contain high potential for geothermal energy, where lithium extraction projects are being proposed.

Executive Summary

Demand for lithium, used in electric vehicle batteries, is skyrocketing. Electric vehicles are important for the transition away from fossil fuels. However, mining lithium has well-documented negative social and environmental impacts. Imperial Valley, in Southern California, is home to one of the largest lithium deposits in the world, and has been dubbed "Lithium Valley." Lithium here is dissolved in the underground brine that is used to generate electricity at geothermal power plants on the south shore of the Salton Sea. Direct lithium extraction is being promoted as more environmentally friendly than other types of lithium mining, but it has never before been used at commercial scales, and communities in Imperial Valley have raised questions about the potential impacts to land, air, water, and public health.

The goal of this report is to educate frontline communities and the public about the potential environmental impacts of lithium extraction in Imperial Valley. This is important from an environmental justice perspective, because disadvantaged communities living near proposed lithium projects already suffer disproportionately from air pollution and other environmental health hazards. Furthermore, Indigenous communities have raised concerns about potential impacts to cultural sites at the Salton Sea.

This report is based on a review of academic literature, government documents, and publicly available documents related to specific lithium projects.

Lithium is conventionally produced from mining hardrock deposits, primarily in Australia, or evaporating brine from salt flats, primarily in South America. In Imperial Valley, lithium is found in hot brine more than 1,500 feet underground in the Salton Sea Known Geothermal Resource Area, on the south shore of the Salton Sea. There are 11 geothermal power plants currently using hot brine to generate steam and produce low-carbon electricity. Direct lithium extraction projects would use technologies such as ion exchange and adsorption to directly remove lithium from the brine before the brine is reinjected deep underground into the geothermal reservoir.

There are currently three companies at various stages of developing lithium extraction projects in Imperial Valley using proprietary technology:

- Berkshire Hathaway Energy Renewables Minerals,
- Controlled Thermal Resources, and
- EnergySource Minerals.

While potential environmental impacts at each site must be analyzed individually, our review identifies five areas of potential impacts to consider:

1 **AIR QUALITY:** Construction and operation of lithium and geothermal facilities in Imperial Valley may impact already degraded air quality through emissions of particulate matter, greenhouse gases, and hydrogen chloride. While these are unlikely to meet legal thresholds that require mitigation for specific projects, it will be important to analyze the cumulative impacts as "Lithium Valley" is built out, including from vehicle trips, battery plants, and other associated infrastructure.

2 **FRESHWATER CONSUMPTION:** Lithium extraction projects will consume Colorado River water for cooling and processing. For example, EnergySource Minerals estimates that its operations will consume 3,400 acre-feet of water to produce 19,000 metric tons of lithium hydroxide per year for 30 years. This is roughly the amount it would take to cover nine football fields, one foot deep with water, every day. While the industry often makes favorable comparisons of how little water direct lithium extraction will use compared to South American operations, these comparisons are difficult to verify, due to lack of transparent data sources. Regardless, freshwater consumption needs to be analyzed in the context of climate change and possible cuts to Imperial Valley's Colorado River allocation. If the lithium industry expands to its planned capacity, it will exceed the freshwater currently allocated by the Imperial Irrigation District for non-agricultural use.

It will be important to analyze the *cumulative* impacts and cumulative pollution as "Lithium Valley" is built out, including from vehicle trips, battery plants, and other associated infrastructure.

3 **SALTON SEA DEGRADATION:** The Salton Sea is a terminal lake—a lake without an outlet—fed by drainage from agricultural fields. Due to water transfers from Imperial Valley to urban areas, evaporation now exceeds inflow, and the Sea is rapidly shrinking, exposing harmful dust contaminated by pesticides and fertilizers. If water is diverted from agriculture to lithium production, it may speed up the shrinking of the Sea. Freshwater consumption by lithium extraction projects may also limit restoration options for the Salton Sea, such as the voluntary transfer of Colorado River water recommended by a panel of independent experts. In this context, water consumption by lithium projects should be carefully analyzed and planned for in order to prevent an indirect contribution to worsening air quality through exposure of the Salton Sea lake-bed.

4 **HAZARDOUS WASTE AND MATERIALS:** Currently, geothermal operations in the region minimize waste by reinjecting spent brine back underground into the geothermal reservoir where it came from, and this practice will continue with the addition of direct lithium extraction technology. However, other elements besides lithium are dissolved in brine and will concentrate on filters, forming "filter cakes" that need to be disposed of. There is potential for this waste to include heavy metals harmful to human health such as arsenic, lead, and cadmium. For example, EnergySource Minerals estimates that 90% of its waste will be non-hazardous and disposed of in California, while 10% of its waste will be hazardous waste that will be disposed of in Arizona. Testing and disclosing of waste content, and proper storage and transport, will be critical.

5 **SEISMIC ACTIVITY:** Lithium extraction itself is unlikely to have an impact on seismic activity in the area. However, commercially successful lithium projects may lead to further geothermal development in this seismically active area. There is disagreement in the scientific literature about how geothermal development impacts seismicity, so this is an area that requires further study. New wells drilled using enhanced geothermal systems, similar to fracking, may have an impact on inducing seismic activity. Imperial Valley is already living with a baseline risk of earthquakes, so lithium extraction infrastructure should be designed with high standards for earthquake safety.

The potential environmental impacts of direct lithium extraction in Imperial Valley may prove to be less harmful than hardrock or evaporation mining. However, there are still potential adverse impacts that should be avoided and mitigated. In order to promote environmental justice, communities should be aware of these potential impacts and be able to fully participate in the environmental review process.

FIGURE 1: At right, "Lithium Valley" is shown in the dotted red circle.

Remote meeting of the Lithium Valley Commission in Calipatria, California. Remote meetings were hosted to allow the engagement of residents of the Lithium Valley and other surrounding communities in the Commission hearings.

Photo: Comite Civico del Valle

Introduction

Demand for lithium is expected to increase dramatically in the coming years, in large part because of its use in batteries for electric vehicles (EVs), which are booming. The need for lithium also stems from California's goal to have all new cars be zero-emission vehicles by 2035. Lithium demand is projected to grow to 280% of current reserves by 2050, with supply primarily coming from new extraction (Dominish et al., 2019). This projection is not set in stone. Improved recycling has the potential to offset new lithium mining by 25% (Dominish et al., 2021), and demand for mined lithium could be reduced even more dramatically by shifts to smaller batteries and away from private car ownership (Riofrancos et al., 2023).

New lithium extraction is being promoted aggressively around the world and in the United States, which has just one active lithium operation, at the Silver Peak mine in Nevada. Most of the lithium mined today comes from Australia and Chile, then is largely refined and manufactured into batteries in China. For this reason, the United States has designated lithium a "critical mineral" for national security, promoting new domestic lithium mining as a way to decrease the risk of supply chain disruptions (Riofrancos, 2023). For example, the 2022 Inflation Reduction Act contains provisions that make EV tax credits dependent on lithium sourced in the United States (or free trade agreement countries). The likelihood of continued high prices and government subsidies has led to a wave of speculation in new lithium projects in the United States, with investors and mining companies hoping to make huge profits.

The U.S. has designated lithium a "critical mineral" for national security, promoting new domestic lithium mining as a way to decrease the risk of supply chain disruptions. The 2022 Inflation Reduction Act contains provisions that make EV tax credits dependent on lithium sourced in the United States.

The likelihood of continued high prices and government subsidies has led to a wave of speculation in new lithium projects in the United States, with investors and mining companies hoping to make huge profits.

Photo: scharfsinn86/stock.adobestock.com

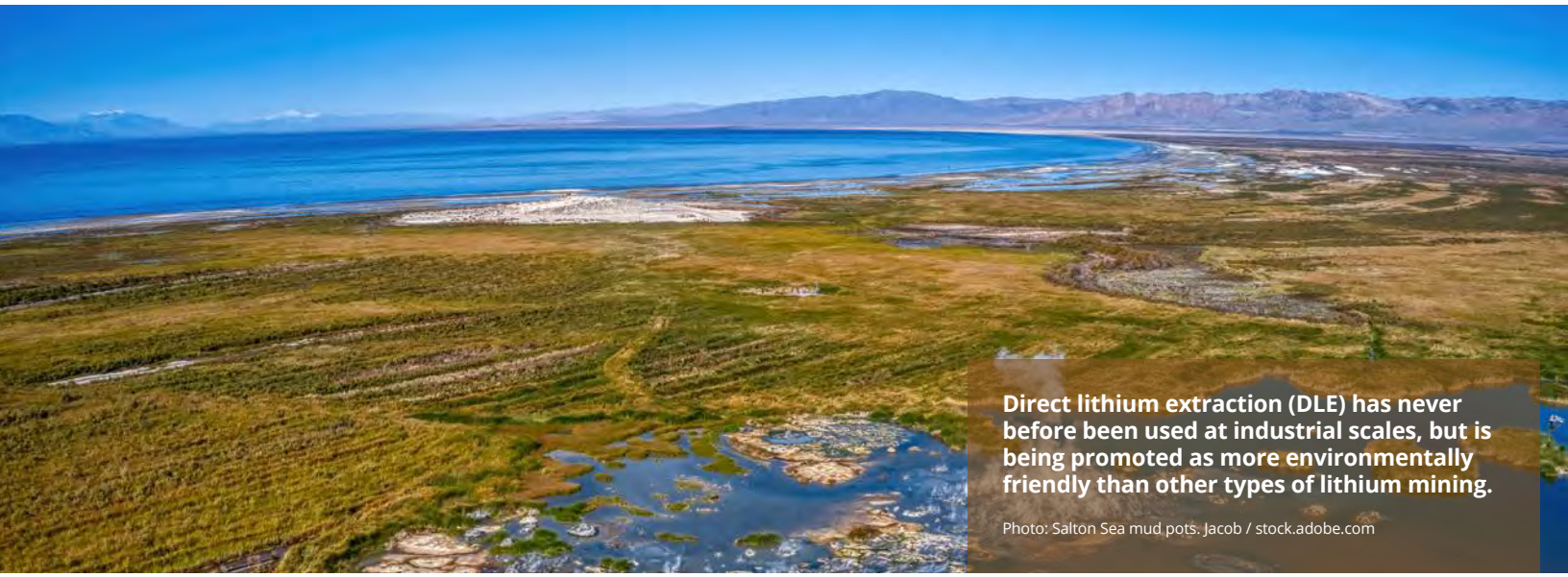
EVs are considered an important part of the solution mix for making the transition away from fossil fuels to a low-carbon economy, and for the most part, EV batteries are lithium-ion based. Lithium extraction, both hardrock mining and brine evaporation, has well-documented negative social and environmental impacts (Blair et al., 2022; Earthworks, 2021a):

1. **Creating water stress in arid environments, resulting in the pollution of air and water,**
2. **Violating the rights of Indigenous Peoples by not respecting their right to Free, Prior and Informed Consent (FPIC), and**
3. **Desecrating sacred landscapes.**

> Inadequate and antiquated mining governance complicates this further. For example, hardrock mining on public lands in the United States is governed by the severely outdated and flawed 1872 Mining Law. The law, which was passed to encourage western settlement on Indigenous lands, includes no environmental provisions, demands no royalties, and establishes mining as the highest and best use of public lands (Earthworks, 2021b).

Imperial Valley, in Southern California, is home to one of the largest lithium deposits in the world, leading investors and prospective developers to dub the area "Lithium Valley."

This lithium, along with many other elements, is dissolved in hot brine deep below ground. This brine is currently extracted through geothermal wells to generate electricity at 11 power plants, and then reinjected back underground into the geothermal reservoir where it came from. Three companies are developing projects to extract lithium at existing and new geothermal plants by using direct lithium extraction (DLE) technologies. DLE refers to a set of physical and chemical processes that would directly remove lithium from brine, similar to how a water softener removes minerals from water. DLE, which has never before been used at industrial scales, is being promoted as more environmentally friendly than other types of lithium mining (Paz et al., 2022).



Direct lithium extraction (DLE) has never before been used at industrial scales, but is being promoted as more environmentally friendly than other types of lithium mining.

Photo: Salton Sea mud pots. Jacob / stock.adobe.com

However, very little information is publicly available about how these technologies work, and their potential environmental impacts. What information is available is highly technical and written by the lithium industry itself. The Blue Ribbon Commission on Lithium Extraction in California met over 20 times between 2021 and 2022, and heard repeated questions from the public about the potential impacts of DLE on land, air, and water. Some of these questions were answered in the Report of the Blue Ribbon Commission Lithium Extraction in California published in December 2022. However, many uncertainties remain that will need to be addressed in the upcoming Salton Sea Renewable Resource Programmatic Environmental Impact Report (PEIR).

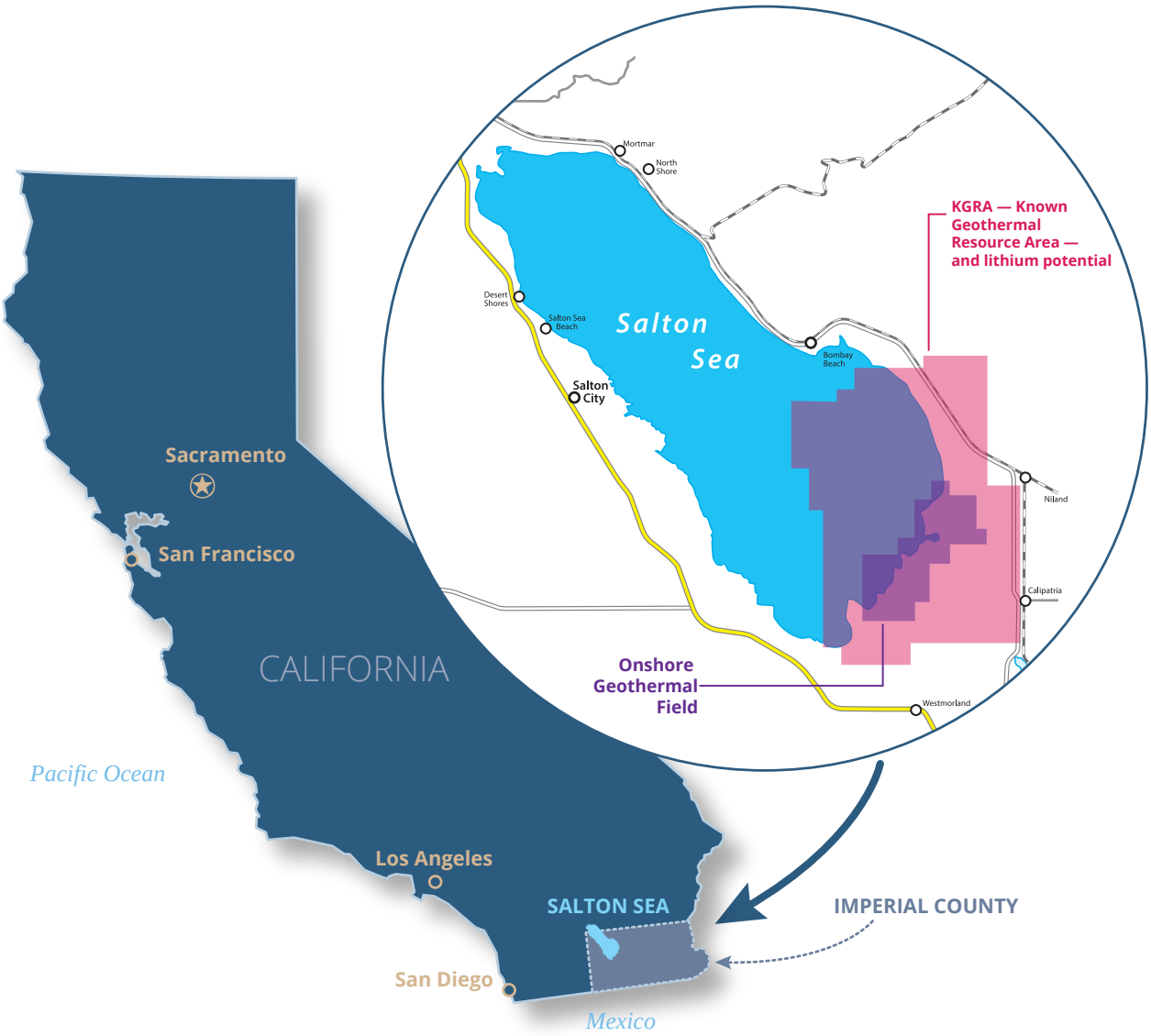


FIGURE 2. In the circle inset map, the shaded pink area is the KGRA, the Known Geothermal Resource Area, with high lithium potential. The shaded purple is the geothermal field that has 11 geothermal plants, which have the capacity to produce about 414 MW of electricity per year.

The Purpose of this Document

This literature review attempts to fill some of the information gaps about DLE, and is meant to serve as an educational tool for frontline communities and the public. It is intended to educate the reader about lithium, geothermal wells, and DLE technologies. It reviews potential environmental impacts of DLE from geothermal brine in the Salton Sea Known Geothermal Resource Area (SSKGRA). It is not a comprehensive assessment of all potential impacts, nor a comprehensive recounting of specific extraction technologies used by companies. The authors hope that communities will find this document a useful starting point for better understanding the potential impacts of lithium extraction so they can be informed participants in the PEIR review process.

Environmental Justice and Community Engagement

It is crucially important that communities understand the potential impacts of lithium extraction in order to advance environmental justice in the region. Disadvantaged, high-poverty Latinx communities living near the area proposed for lithium extraction in Imperial County already suffer adverse impacts from pollution from the Salton Sea and industrial agriculture. This includes high rates of asthma, likely to increase due to airborne dust from the receding Salton Sea's exposed lake-bed (Farzan et al., 2019). According to CalEnviro Screen data accessed in 2023, the census tract closest to proposed lithium extraction ranks in the 82nd percentile of communities most impacted by environmental health burdens in California. Throughout the life of the Lithium Valley Commission, these communities have raised questions about the potential impacts of lithium extraction, and voiced concerns over further exposure to environmental health hazards. Analyzing the potential benefits and risks of lithium extraction in Imperial Valley cannot be separated from the underlying context and history of disproportionate environmental impacts, as fence-line communities work towards the goal of advancing environmental justice through informed participation in decision-making about "Lithium Valley." The community's right to know about the full range of consequences of lithium extraction proposals is a key pillar of environmental justice.

Construction of dust mitigation berms at the Salton Sea.

Photo: Comite Civico del Valle

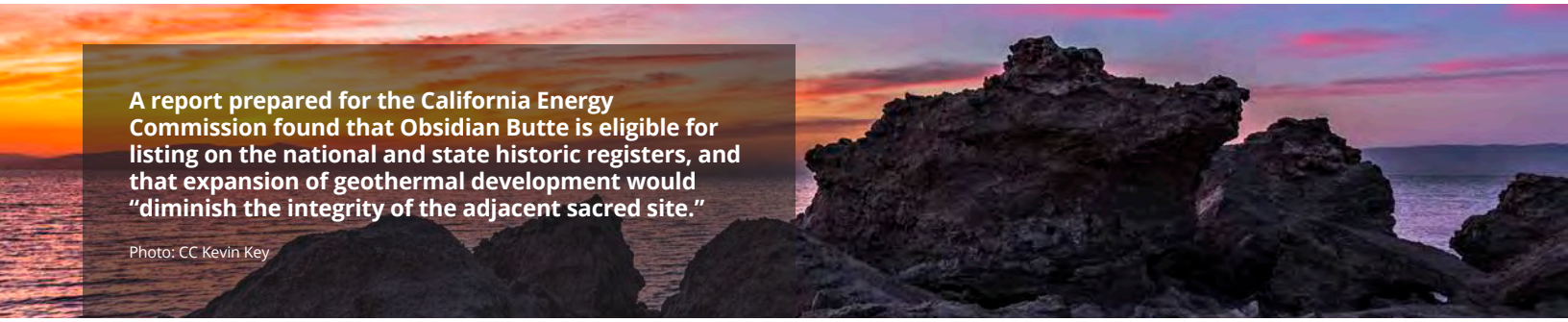
Indigenous Rights

In the United States and around the world, mining impacts disproportionately fall on vulnerable and marginalized communities, particularly Indigenous Peoples (Earthworks, 2021b). These impacts can range from destruction of sacred, cultural, and religious sites, infringement of tribal sovereignty and violation of treaty rights, and increased gender-based violence associated with "man camps" to house workers for extractive projects. Many of these impacts are irreversible, and in the case of impacts to sacred sites, impossible to mitigate. Globally, roughly 85% of lithium resources and reserves are located on or near the territories and lands of Indigenous Peoples (Owen et al., 2022). In the United States, 79% of lithium deposits are located within 35 miles of Native American reservations (Block, 2021). Even lithium deposits more distant from present-day reservations are located on ancestral territories that may hold great cultural importance for Native communities. In the United States and around the world, the projected increase in lithium mining will likely have a disproportionate impact on Indigenous communities.

The UN Declaration on the Rights of Indigenous Peoples enshrines the right to Free Prior and Informed Consent, including the right to say no to development.

Proposed lithium extraction in Imperial Valley is located in the footprint of the ancient Lake Cahuilla, ancestral lands of the Cahuilla, Kamia, Quechan, Kumeyaay, and other Indigenous Peoples (Voyles, 2021). In public comments to the Lithium Valley Commission meetings, tribal leaders raised concerns about the absence of legally required government-to-government consultation on lithium projects, possible environmental impacts, and impacts to cultural sites in the area. Of particular concern is protecting Obsidian Butte, a volcanic outcropping on the shore of the Salton Sea held sacred by multiple tribes in the area. According to Quechan and Kamia elder Preston J. Arrow-Weed, Obsidian Butte is a sacred place that should be left undisturbed (Arrow-Weed, 2022). Similarly, Carmen Lucas (Kwaaymii Laguna Band of Indians) urged protection of cultural resources at the Southeast Lake Cahuilla Active Volcanic Cultural District (Lucas, 2022). A 2010 report prepared for the California Energy Commission found that Obsidian Butte is eligible for listing on the national and state historic registers, and that expansion of geothermal development would "diminish the integrity of the adjacent sacred site" (Gates & Crawford, 2010).

The UN Declaration on the Rights of Indigenous Peoples, and other international human rights standards such as the International Labor Organization (ILO) 169 Convention, enshrine Indigenous Peoples' right to Free, Prior, and Informed Consent (FPIC) on projects affecting their lands, territories, resources, and cultural heritage. This includes the right to meaningful dialogue and the right to say "yes," "no," or "yes with conditions" to a project, and to revoke consent at any time. Thus, understanding the possible environmental impacts of lithium extraction in Imperial Valley is crucial for upholding Indigenous rights.



A report prepared for the California Energy Commission found that Obsidian Butte is eligible for listing on the national and state historic registers, and that expansion of geothermal development would "diminish the integrity of the adjacent sacred site."

Photo: CC Kevin Key

Literature Review

To better understand the potential environmental impacts of direct lithium extraction (DLE) in Imperial Valley, the authors reviewed academic literature, government documents, and publicly available documents related to specific lithium projects. The review that follows summarizes key findings, including background on the lithium brines found at the Salton Sea, an explanation of geothermal energy, how DLE technologies work, and an overview of potential impacts. We cover:

- Lithium Brines in General
- Salton Sea Geothermal Lithium Brines
- Geothermal Power Plants
- Direct Lithium Extraction, and
- Direct Lithium Extraction at the Salton Sea

Lithium Brines in General

Lithium is the lightest metal element and has a high electrochemical potential, meaning it can store a lot of energy in a battery. Lithium is a highly reactive material that does not exist in its elemental form in nature. Lithium readily forms bonds, forming lithium salts that easily dissolve in water. These elemental characteristics of lithium make it an important part of industrial processes (Evarts, 2015). Lithium is used for a variety of purposes, such as ceramic and glass production, but an estimated 80% of global lithium produced today goes to rechargeable lithium-ion batteries (U.S. Geological Survey, 2023).

Electrification of transportation and energy storage is increasing the demand for high-efficiency lithium-ion batteries worldwide (Bridge & Faigen, 2022). In the United States, lithium is classified as a "critical mineral" for strategic, consumer, and commercial industries, and a priority for the development of domestic resources (U.S. Department of Energy, 2021). Identifying and extracting lithium from national

Here is an example of evaporation ponds used to extract lithium from brine in Chile's Atacama desert.

Photo: freedom_wanted / stock.adobe.com

lithium reserves is a major focus of federal and state governments. To date, lithium production in the United States has been minimal and most lithium has been imported from Chile and Argentina (U.S. Geological Survey, 2022). Major resources of lithium are held in pegmatite deposits (a type of igneous rock), sedimentary (clay) deposits, or in brines.

Brines are increasingly important for global lithium production (Bradley et al., 2017). Continental lithium brines are found in salars, or salt flats. They are created in endorheic basins (basins from which there is no outflow to other waterbodies) where evaporation is much greater than precipitation (Munk et al., 2016). In general, these lithium brines form when water transports dissolved lithium into an endorheic basin, and then the water evaporates, leaving behind lithium and other salts. This process is repeated over lengthy periods leading to increasing salinity and lithium content within the basin, as shown in see Figure 3 (Rossi et al., 2022). The lengthy periods (thousands to millions of years) required to generate economically viable lithium deposits make this a non-renewable resource over human time-scale. Currently, lithium is extracted from salars in South America and Nevada using large evaporation ponds. New processes in lithium extraction have opened non-traditional resources for exploitation including geothermal and oilfield brines (Kesler et al., 2012).

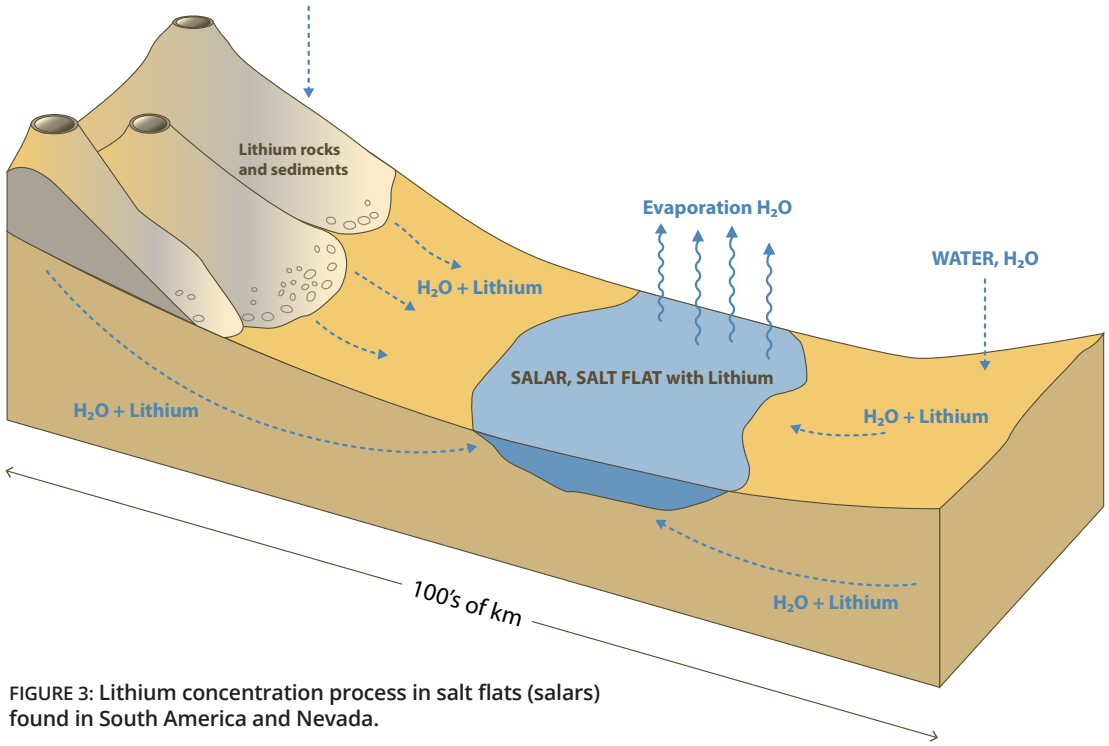


FIGURE 3: Lithium concentration process in salt flats (salars) found in South America and Nevada.

Adapted from Rossi et al., 2022.

Salton Sea Geothermal Lithium Brines

It is important to note that the source of lithium in the SSKGRA is not the Salton Sea itself. Rather, the lithium is dissolved in brine in the geothermal reservoir located more than 1,500 feet underground (Paz et al., 2022). The Salton Sea geothermal brine is estimated to contain lithium at concentrations ranging from 90–440 parts per million, a very high concentration compared to other geothermal fields in the United States (Stringfellow & Dobson, 2021). The portion of the brine reservoir currently exploited for geothermal energy is estimated to hold 2 million metric tons of lithium, making it one of the largest lithium reserves in the world (McKibben et al., 2021). If fully exploited, the SSKGRA is expected to be able to produce more than 600,000 metric tons of lithium carbonate equivalent (LCE) per year (Ventura et al., 2020). For reference, in 2022 global production was estimated at 737,000 metric tons of LCE, and demand is expected to grow rapidly. Because lithium can take a variety of forms, converting to LCE is the industry standard for making comparisons about the amount of battery-grade lithium a deposit can produce, assuming 100% recovery.

Research is underway to better understand how much lithium can be extracted from the reservoir, which source rocks it comes from, and how quickly it regenerates, with some estimating that the deposit could support 50–100 years of lithium production (Chao, 2022). The geothermal brine found in the SSKGRA also contains economically exploitable levels of magnesium, zinc, and high concentrations of other metals and minerals (Chao, 2020).

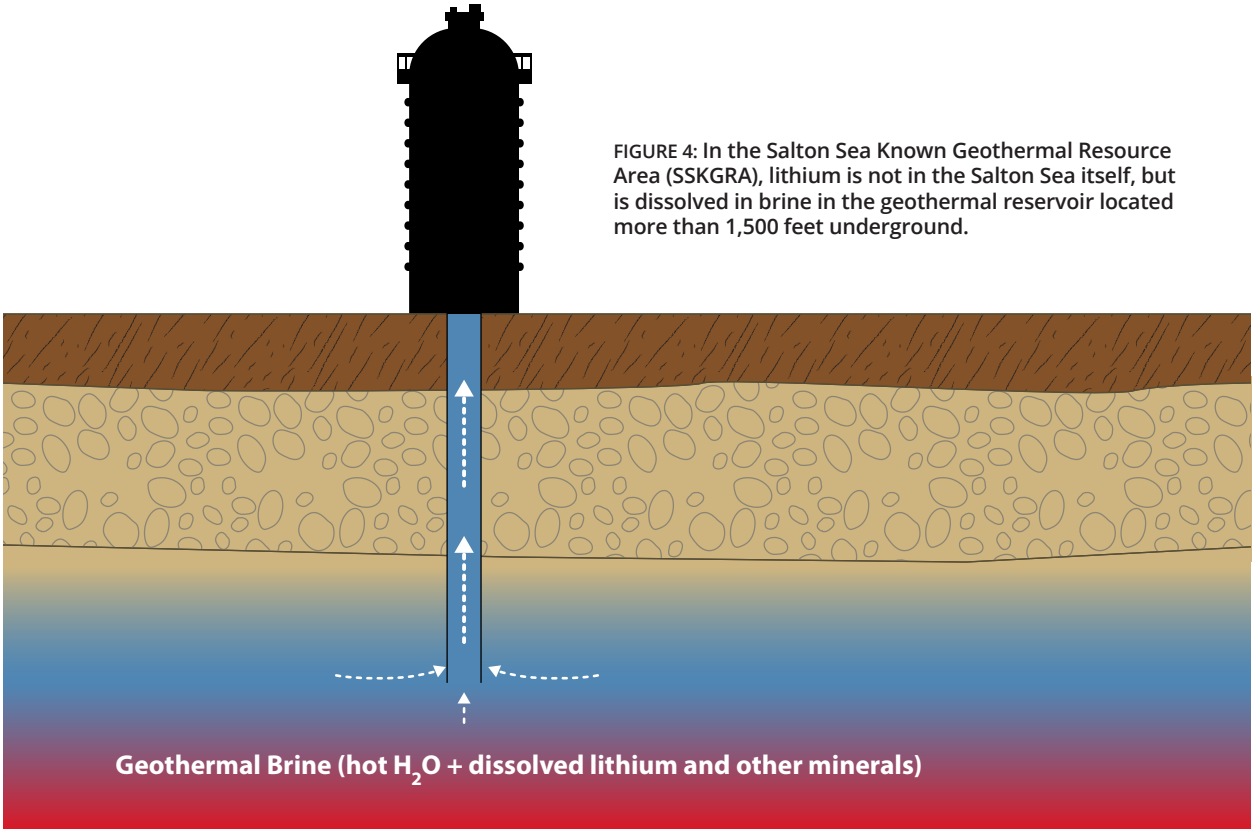


FIGURE 4: In the Salton Sea Known Geothermal Resource Area (SSKGRA), lithium is not in the Salton Sea itself, but is dissolved in brine in the geothermal reservoir located more than 1,500 feet underground.

Geothermal Power Plants

Proposed lithium extraction from SSKGRA brines would be connected to existing or newly constructed geothermal plants that extract brine from geothermal wells. In general, geothermal wells draw hot water from the earth for heating, cooling, or electrical production. The first geothermal power plant in Imperial Valley was constructed in 1982. As of 2023, there are 11 geothermal power plants operating in the SSKGRA. They are located primarily on private land, though some lease state land. These power plants have the capacity to produce 414 megawatts (MW) of electricity, roughly enough to power 300,000 homes (Paz et al., 2022). It is estimated that with new power plants, this could increase by more than six times, up to 2,950 MW, including on land that will be exposed by the receding Salton Sea (DiPippo & Lippmann, 2017).

Developing new geothermal power plants is a priority for the State of California, because they provide low-carbon, renewable, reliable energy. There are about 28 production wells in the field producing over 265 billion pounds of brine annually, and 41 injection wells reinjecting just over 220 billion pounds of produced brine (California State Lands Commission, n.d.). The difference is likely due to release of steam and removal of silica (disposed of as waste). Now, there is interest in extracting lithium from this brine before it is reinjected, both at existing and new geothermal power plants.

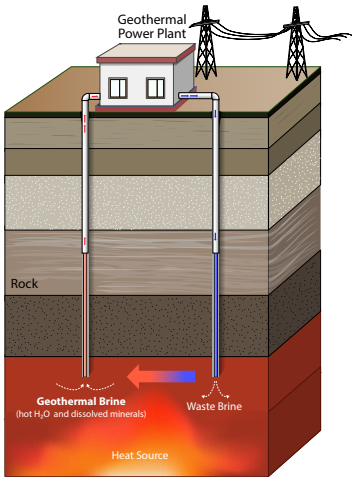


FIGURE 5: A simple overview of a geothermal plant, where wells (production wells) bring hot water or steam to the power plant to generate electricity, then the cooled water is injected back into the geothermal reservoir.

Adapted from istock.com/ttsz

One of the geothermal facilities in operation in the Lithium Valley region.

Photo: Comite Civico del Valle

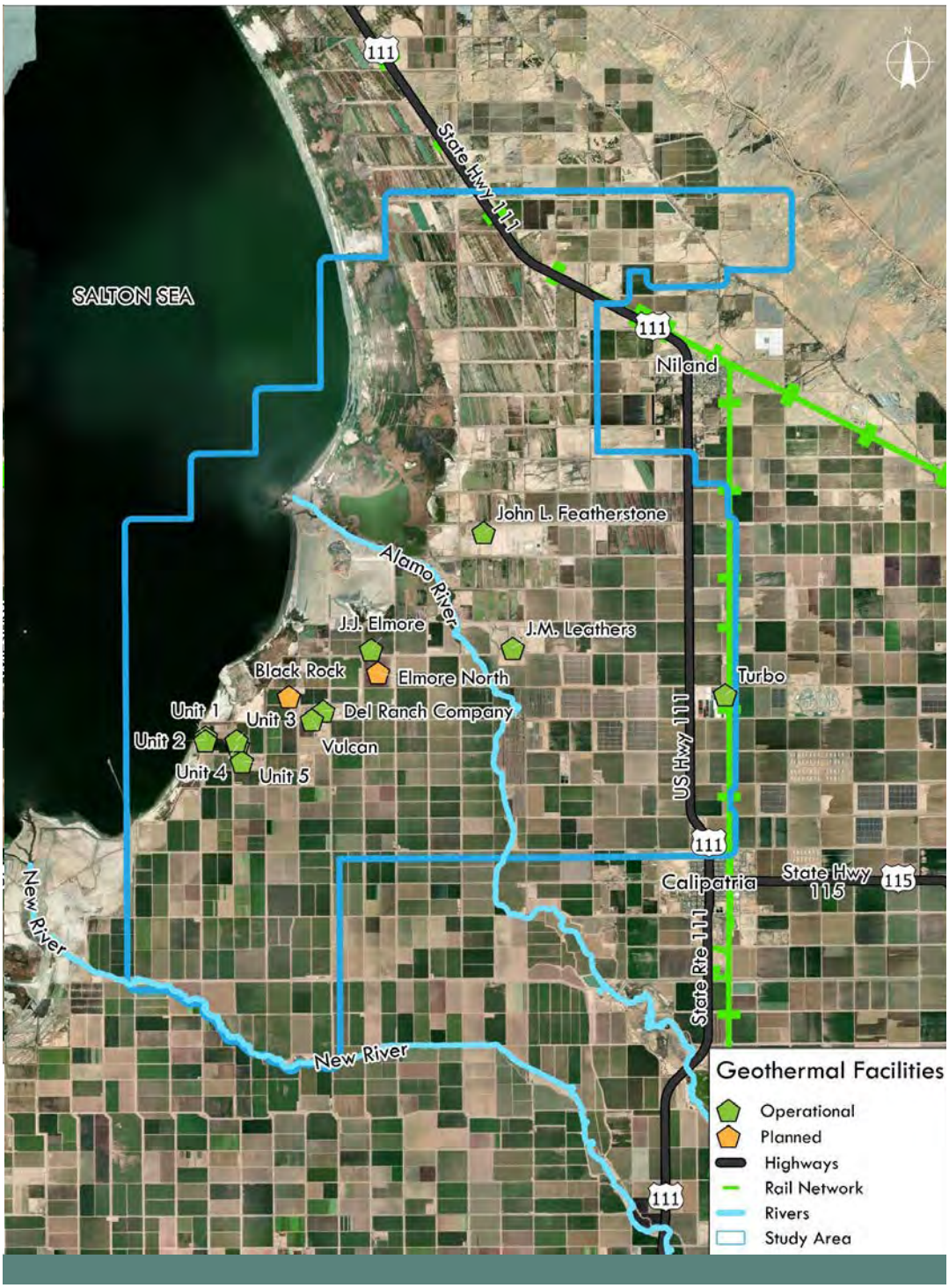


FIGURE 6: Proposed and operational geothermal plants. There are 11 operating geothermal plants as of July 2023, generating 414 megawatts (MW) of electricity, roughly enough to power 300,000 homes. It is estimated that with new power plants, this could increase by more than six times, up to 2,950 MW.

From a presentation by Imperial County, California, July 2023.

There are three main types of geothermal electrical generation systems:

- Flash steam, (used in the Salton Sea geothermal plants),
- Dry steam, and
- Binary cycle

The Salton Sea geothermal plants are exclusively flash steam power systems, as shown in Figure 7. Geothermal wells allow high-temperature water from deep underground to rise from the production well to a tank on the Earth's surface. The change from high to low pressure causes the water to "flash" to steam. This steam then drives the turbine to generate electricity. The spent brine is then injected back into the geothermal reservoir, with some solid waste being sent to a landfill. Operating these wells at the SSKGRA requires electricity purchased from the Imperial Irrigation District (IID).

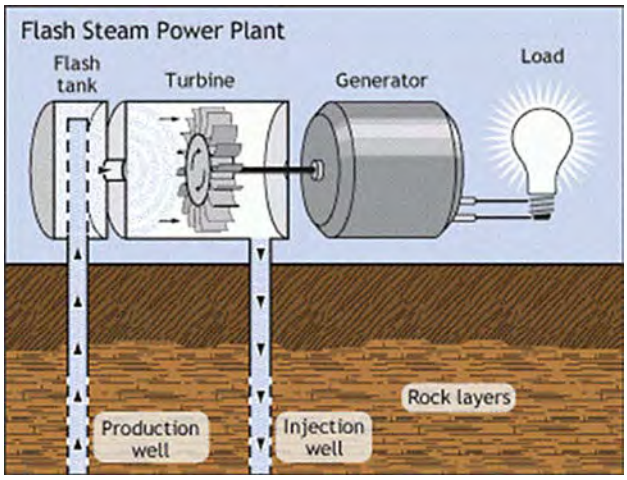


FIGURE 7: Flash steam geothermal plant. High temperature water is pumped out from high to low pressure, causing the water to "flash" to steam, which then drives a turbine to generate electricity. The cooled, condensed water is reinjected into the geothermal reservoir.

From U.S. Energy Information Administration, 2022.

Brine production and power generation from geothermal wells can decline over time for a variety of reasons, including loss of permeability from mineral build up. To restore and improve permeability in geothermal wells, geothermal plants often employ a form of hydraulic fracturing (fracking) where pressurized fluids are injected into the subsurface to create cracks in the rock. This process, shown in Figure 8 is called an Enhanced Geothermal System (EGS) (National Renewable Energy Laboratory, n.d.). While EGS is not currently used at the SSKGRA, it may be used in the future (Roth, 2014).

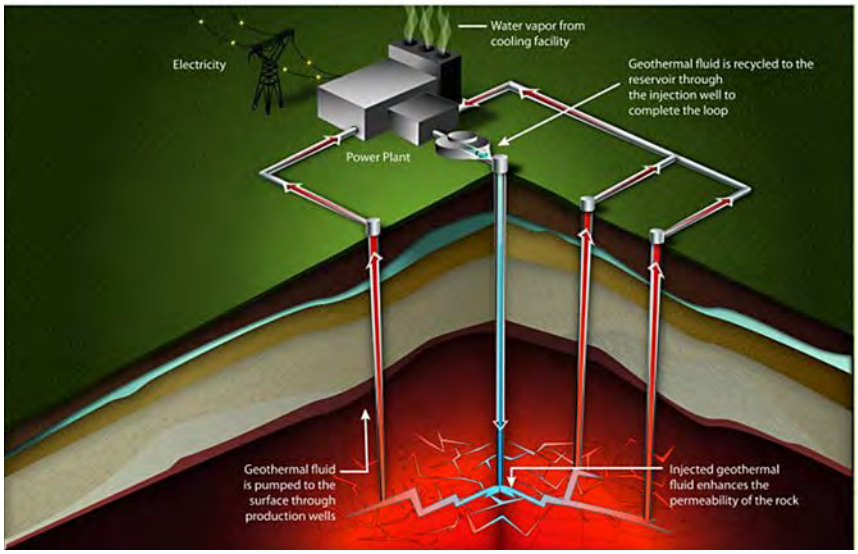


FIGURE 8: Enhanced Geothermal System uses hydraulic fracturing (fracking) to to increase/restore the permeability of the rock allowing the water to flow more freely.

From National Renewable Energy Laboratory, n.d.

Direct Lithium Extraction Overview

Unlike hardrock or evaporation mining, DLE does not require major disturbance of land, and has a much smaller physical footprint, so it is touted as a more environmentally friendly approach to lithium extraction (Stringfellow & Dobson, 2021). Based on the proposals at the Salton Sea to date, ion exchange in combination with adsorption are the most likely DLE technologies that will be deployed. Ion exchange technology uses a material designed to attract cations (positively charged particles) or anions (negatively charged particles). Attached selected ions are then removed, using a solvent, acid, or other transfer fluid.

Ion exchange itself is not a recent technology, but it has never been used to remove lithium from geothermal brine at commercial scales.

A familiar example of this is a water softener, which removes calcium and magnesium from water. Calcium and magnesium-rich water are passed through a "bed" that contains ion exchange resin beads which are charged with sodium ions. Calcium and magnesium replace the sodium attached to the ion exchange beads, releasing the sodium into the water.

The major difference between ion exchange used for a water softener and for lithium extraction is that the ion exchange beads need to be highly selective to lithium. The makeup of these lithium-attracting materials is generally patented and proprietary, but they would follow the same general principle (Stringfellow & Dobson, 2021). Once attached to this ion exchange bead, the lithium would be removed using an acid or base, most likely hydrochloric acid. The lithium is then transferred for further processing and filtration. The benefit of ion exchange technology is the way it selectively collects lithium, allowing anything unused to be directly disposed into the geothermal reservoir when the brine is reinjected.

Ion exchange itself is not a recent technology, but it has never been used to remove lithium from geothermal brine at commercial scales. An important application of ion exchange technologies to lithium extraction is the implementation of ion sieve technology. Ion sieves function in the same way as ion exchange beads. The major difference is the special material used to attract the lithium forms a structure that only accepts particles of a specific size or smaller (Weng et al., 2020). A simple diagram of DLE from geothermal brine is shown in Figure 9 (Stringfellow & Dobson, 2021).

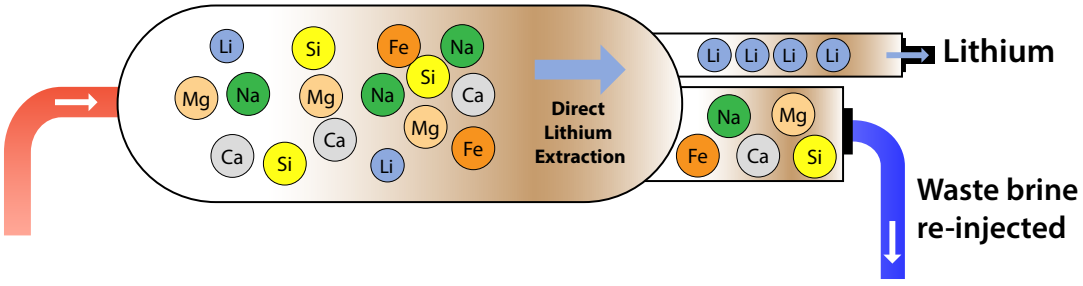


FIGURE 9: Direct lithium extraction from geothermal brine.
Adapted from Stringfellow & Dobson 2021.

Direct Lithium Extraction Proposals at the Salton Sea

Starting in 2008, Simbol Inc. in partnership with EnergySource operated multiple pilot-scale experiments at the John L. Featherstone (Hudson Ranch I) Power Plant (Harrison, 2014). The project, funded by the U.S. Department of Energy and the California Energy Commission, ceased in 2016 due to Simbol's financial troubles and a failed acquisition deal with Tesla (Roth, 2017). This, in turn, has resulted in a prolonged dispute over lithium extraction patents (Scott, 2021).

As of June 2023, there are three companies at various stages of developing lithium extraction projects near the Salton Sea:

1. **BERKSHIRE HATHAWAY ENERGY RENEWABLES MINERALS (BHER MINERALS)** wholly owned subsidiary CalEnergy operates 10 geothermal power plants in the SSKGRA. BHER Minerals started a one-tenth scale lithium demonstration project at one of their plants in 2022. According to California Environmental Quality Act (CEQA) documents, BHER planned to use ion exchange technology developed by Lilac Solutions (California Energy Commission, 2020). They are also building a demonstration plant to process lithium chloride into battery grade compounds (Scheyder, 2022). Depending on the results of these demonstrations, BHER will consider building commercial-scale DLE plants at existing, and possibly new, geothermal facilities. BHER is proposing to build three new geothermal plants: Black Rock (77 MW), Elmore North (140 MW), and Morton Bay (140 MW). These proposals do not currently include plans for lithium extraction, but such plans may be added in the future.

2. **CONTROLLED THERMAL RESOURCES (CTR)** is proposing to build a new geothermal power plant, combined with a DLE plant, in a project called "Hell's Kitchen." An Initial Study & Environmental Analysis was completed in March 2022, finding potentially significant impacts that need to be analyzed in an Environmental Impact Report (EIR). A draft EIR was published in August 2023. Previously, CTR had planned to use Lilac Solution's ion exchange technology, but Lilac pulled out due to concerns about how their technology would be able to handle the hot, corrosive brine (Ohnsman, 2022). CTR has said they are moving forward with adsorption rather than ion exchange technology (Controlled Thermal Resources, 2022b). While often used in combination, adsorption relies on a physical separation of lithium rather than depending on exchange of charged particles. According to media reports, CTR is now partnering with Koch Separation Solutions, a subsidiary of Koch Industries, for its DLE technology (Scheyder, 2022). On its website, Koch Separation Solutions describes its Li-Pro DLE technology as using adsorption beds to extract lithium, requiring fewer chemical and water inputs than other methods (Koch Separation Solutions, 2023).

3. **ENERGYSOURCE MINERALS (ES MINERALS)** is developing Project ATLiS to extract lithium at the John L. Featherstone (Hudson Ranch 1) Power Plant. The project completed its CEQA review and received a conditional use permit from Imperial County in 2021. Aiming to be operational by 2024, ES Minerals is the furthest along of the Salton Sea DLE projects. In its EIR, ES Minerals states that the lithium extraction process is proprietary (Chambers Group, Inc., 2021). Its website states it will use their proprietary Integrated Lithium Adsorption Desorption (ILiAD) processing platform (EnergySource Minerals LLC, n.d.-b).

ES Minerals holds a patent issued in 2020 valid through 2038 for a lithium removal process that details the extraction of lithium carbonate, lithium hydroxide, zinc, and manganese from Salton Sea geothermal brines (Featherstone et al., 2020). It is likely that this patented process is the ILiAD process that ES Minerals will employ in their ATLiS project. In general, ILiAD works in three steps on geothermal brine after it generates steam in the power plant, and before reinjection.

1. Remove impurities such as iron, silica, zinc, and manganese.
2. Extract lithium chloride from the brine.
3. Convert lithium chloride to lithium carbonate or lithium hydroxide.

While the ILiAD lithium extraction process is proprietary and specific to ES Minerals, all proposed DLE projects in the SSKGRA will likely follow the same general steps.

One of the new test sites developed for lithium extraction outside of Calipatria. This site is operated by Controlled Thermal Resources (CTR).

Photo: Comite Civico del Valle

Potential Environmental Impacts

This section reviews potential impacts of DLE in Imperial Valley related to:

- Air Quality,
- Freshwater Consumption,
- Salton Sea Degradation,
- Hazardous Waste and Materials, and
- Seismicity.

It draws on the general scientific literature, proceedings of the Lithium Valley Commission, and also information about specific projects from CEQA documents.

Air Quality

Imperial Valley has degraded air quality that is negatively impacting human health. Recently, air quality in Imperial Valley has exceeded Clean Air Act standards for Ozone, $PM_{2.5}$ (particulate matter smaller than 2.5 microns), and PM_{10} (particulate matter smaller than 10 microns) (California Air Resources Board, 2022). Exposure to PM_{10} and $PM_{2.5}$ has been linked to a variety of health problems including asthma, chronic coughing, difficulty breathing, irregular heartbeat, heart attacks, and premature death for those with heart and lung disease (U.S. EPA, 2016).

Lithium extraction is anticipated to have some direct impacts to air quality, though it is not likely to meet legal thresholds that require mitigation. Of the lithium projects under development while this report was being written, only ES Minerals had published an EIR, which can be used as an example to better understand the potential impacts to air quality.

Imperial Valley has degraded air quality that is negatively impacting human health. Recently, air quality in Imperial Valley has exceeded Clean Air Act standards for Ozone, $PM_{2.5}$ (particulate matter smaller than 2.5 microns), and PM_{10} (particulate matter smaller than 10 microns).

The ES Minerals EIR estimates that the project will average 16,650.91 metric tons of carbon dioxide equivalent per year. These emissions will likely be front-loaded due to construction, which are averaged over the 30-year projected lifetime of the project. These are below thresholds defined by the U.S. Environmental Protection Agency (25,000 metric tons/year) and Imperial County Air Pollution Control District (ICAPCD) (20,000 metric tons/year). This means there is no mitigation required under those regulations. Even so, estimated emissions make up 83% of the permissible emissions without mitigation, and have an impact on global climate change, which must be considered.

ES Minerals will use hydrochloric acid (HCl), injecting it into the brine as part of the mineral extraction process, which could lead to hazardous air emissions. HCl is a gas under normal temperatures, and the acid is a result of dissolving this gas in water. Thus, industrial grade HCl commonly releases hydrogen chloride gas. ES Minerals estimates it will release 7,440 pounds per year of HCl aerosols. This is below the 10,000 pounds per year threshold for reporting requirements under Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986. However, according to the EIR, exposure to

HCl can cause a range of health impacts, including difficulty breathing. It is likely that other lithium projects will also use HCl. For example, CTR states in its initial study that it will use HCl as part of a process to manage silica in the brine to prevent scaling (County of Imperial Planning & Development Services Department, 2022).

Lithium facilities will also impact air quality through day-to-day operations. For example, the ES Minerals facility will require an estimated 179 vehicle trips in and out of the plant per day during normal operations, contributing to air emissions. The model used in the ES Minerals EIR assumes that all roads for operational processes and work commuting to the site will be paved at the time of operation. However, these roads are not currently paved, and there may be additional air quality impacts from road construction or vehicle trips on unpaved roads.

The cumulative impacts on air quality from lithium extraction should also be analyzed in conjunction with potential impacts from other aspects of the lithium supply chain, such as proposed battery manufacturing in the region.

Lithium production can avoid major direct impacts on air quality by limiting exposure of brine, lithium, and waste solids to wind. ES Minerals has stated they are enclosing much of their system and implementing filter processes for lithium handling and processing to avoid these impacts. However, special attention should be given to any project proposal that contains mention of exterior storage of waste materials, finished products, evaporation ponds, and brine storage ponds. Winds will blow across any exposed waste, picking up contaminants, transporting them across the valley, and exposing surrounding communities and the environment to those wind-blown contaminants.

While the estimated air emissions from ES Minerals are below thresholds for significant impact on air quality, they are close to those thresholds. Expansion of the lithium industry may have a significant additive impact on the already poor air quality in the region. The cumulative impacts on air quality from lithium extraction should also be analyzed in conjunction with potential impacts from other aspects of the lithium supply chain, such as proposed battery manufacturing in the region.

South shore of the Salton Sea near proposed DLE projects. The trenches are for dust suppression to alleviate air pollution. The green in the foreground is a wetland restoration project.

Photo: Earthworks

Water Consumption

Freshwater is required for geothermal power plants. Water pulled from the geothermal brine is reinjected back into the reservoir with small losses from transport and cooling. Often, make-up water from other sources is injected into the aquifer to limit the amount of water loss in the geothermal reservoir and prevent subsidence.

Adding DLE will consume additional freshwater as part of the lithium separation process. It is difficult to predict exactly how much water Imperial Valley DLE projects will require when they reach commercial scale, but we can estimate based on what each company has stated:

- ES Minerals estimates in its EIR that operations will consume 3,400 acre-feet of water to produce 19,000 metric tons of lithium hydroxide per year over a lifetime of 30 years (Chambers Group, Inc., 2021).
- CTR estimates in its initial study that their Hell's Kitchen project will consume 6,700 acre-feet of water per year to produce 25,000 metric tons of lithium hydroxide per year (County of Imperial Planning & Development Services Department, 2022).
- BHER has not yet estimated water consumption in environmental planning documents. However, they have stated to the Lithium Valley Commission that they plan to limit freshwater usage to 50,000 gallons per metric ton of lithium carbonate equivalent (Paz et al., 2022).

For reference, an acre-foot of water is about the amount of water it would take to flood a football field (roughly one acre in size) one foot deep. An average household in California uses ½–1 acre-foot of water per year (Water Education Foundation, 2020). For comparison, growing one acre of alfalfa in Imperial Valley can use as much as 10 acre-feet of water per year (Bland, 2023).

TABLE 1: Estimated freshwater consumption of Imperial Valley direct lithium extraction projects.

Project	Metric tons of lithium hydroxide produced / year[1]	Metric tons of LCE produced / year[2]	Acre-feet of water / year	Acre-feet water / metric ton of LCE	Gallons of water / metric ton of LCE	m^3 of water / metric ton of LCE
BHER Minerals[3]	**Unknown**	**Unknown**	**Unknown**	**0.15**	**50,000**	**189**
ES Minerals	**19,000**	**16,720**	**3,400**	**0.20**	**65,170**	**247**
CTR	**25,000**	**22,000**	**6,700**	**0.30**	**97,755**	**370**

[1]Both CTR and ES Minerals estimate their lithium production in terms of metric tons of lithium hydroxide. After extraction and refining, this is the final battery grade compound that will be sold to a buyer.

[2]To convert lithium hydroxide to lithium carbonate equivalent (LCE), the industry standard, you multiply by a factor of .880 (see https://casetext.com/statute/california-codes/california-revenue-and-taxation-code/division-2-other-taxes/part-25-lithium-extraction-tax-law/chapter-2-the-lithium-extraction-excise-tax/section-47015-conversion-to-to-lithium-carbonate-equivalent).

[3]BHER's estimate of freshwater consumption is from testimony to the Lithium Valley Commission, not from environmental analysis of a DLE project. This estimate may change in the future. As of 2023, BHER is demonstrating lithium extraction at one-tenth scale, and has not proposed commercial-scale extraction. No information is available on how much lithium BHER would produce per year at commercial scales in the future.

Note that these estimates only account for operation of lithium extraction facilities, not construction, or other steps of the lithium refining and battery production process. The majority of this water would be provided by canals managed by the IID. Some projects may use steam condensate from the geothermal process to help meet freshwater needs for lithium extraction. However, this may end up requiring additional make-up water (McKibben, 2023).

As the lithium industry in Imperial Valley expands, it may be limited by water supply. IID manages an entitlement of 3.1-million-acre feet of Colorado River water for Imperial Valley, 97% of which is used for agriculture (Imperial Irrigation District, 2023). IID has reserved up to 25,000-acre feet of water per year for non-agricultural use, which would supply proposed lithium projects. If the ES Minerals project is used as a best guess for water use, this IID allocation could support 100,200 metric tons of LCE production per year. According to the Lithium Valley Commission, proposed lithium production is projected to reach 210,000 metric tons of LCE per year, meaning water demand would exceed available non-agricultural supply as currently planned by IID (Paz et al., 2022).

According to the Lithium Valley Commission, proposed lithium production is projected to reach 210,000 metric tons of LCE per year, meaning water demand would exceed available non-agricultural supply as currently planned by the Imperial Irrigation District.

Addressing questions around water consumption is especially urgent given the impact of climate change on Colorado River water supplies. Drought, over-allocation of water resources, and historically low water levels in critical reservoirs (Lake Mead and Lake Powell) will result in re-adjusted water allocation in the near and long-term for Imperial Valley. In 2022 the Bureau of Reclamation called for cutting 2–4 million acre-feet of Colorado River water use (Short and Long Term Solutions to Extreme Drought in the Western United States, 2022). As of May 2023, California has agreed to conserve 1.6 million acre-feet by 2026, the majority of which would come from Imperial Valley (Wilson, 2023). Further cuts will likely be necessary in the future.

Proponents of DLE projects in Imperial Valley often make favorable comparisons about water consumption to lithium evaporation facilities in South America:

- BHER told the Lithium Valley Commission it will use 90% less freshwater than what is used in South America (Paz et al., 2022).
- ES Minerals' website shows it will deplete just a fraction of the water depleted at Chilean brine operations (EnergySource Minerals LLC, n.d.-a).
- CTR's brochure emphasizes it uses the most environmentally-friendly lithium production process on the planet but provides no information on water consumption (Controlled Thermal Resources, 2022a).

It is difficult to verify these comparisons due to lack of transparent data from South America. However, a recent academic review found that "many DLE technologies might require larger freshwater volumes than current evaporative practices" (Vera et al., 2023). **In fact, if we look strictly at freshwater consumption, proposed DLE projects in Imperial Valley would actually consume more water than the current evaporation mining at Salar de Olaroz in Argentina, which requires an estimated 50 cubic meters per metric ton of LCE (Vera et al., 2023).**

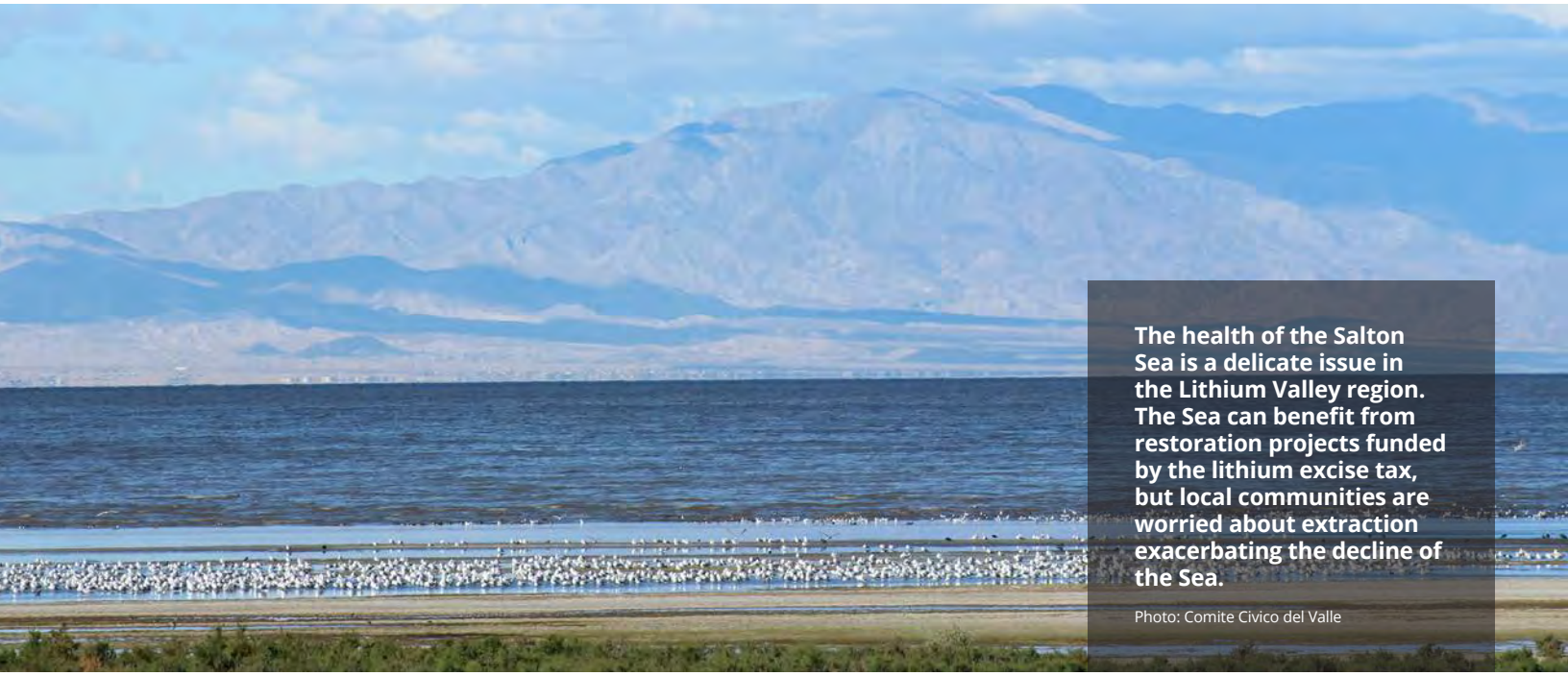
There is an ongoing debate about how much water is lost at South America lithium operations, not only due to freshwater consumption, but from brine evaporation itself, and the poorly understood interaction of brine with the freshwater aquifer. Some have estimated water lost through evaporation to be as much as 2,000 cubic meters per metric ton of LCE (Blair et al., 2022). When this is taken into account, DLE at the Salton Sea can be expected to deplete significantly less water.

No matter how direct lithium extraction compares to other types of lithium extraction, Imperial Valley will likely need to make tough decisions about how much freshwater to allocate to DLE and geothermal energy, agricultural use, and Salton Sea restoration.

Salton Sea Degradation

Freshwater consumption for lithium extraction may also have an impact on the Salton Sea. The lake we now call the Salton Sea has always been in the process of forming or disappearing, depending on when naturally occurring Colorado River floods filled the low-lying area known as the Salton Sink (Voyles, 2021). The current Salton Sea was formed in 1905, filling with Colorado River water often attributed to an accidental irrigation dam breach (Salton Sea Authority, n.d.). Due to the 2003 Quantification Settlement Agreement, which transferred water from Imperial Irrigation District to San Diego, the Salton Sea has been rapidly shrinking (Foruzan, n.d.). The Salton Sea currently receives 1.1 million acre-feet of water per year, primarily through drainage from agricultural fields, and this will likely continue to decrease (Salton Sea Management Program, 2022). If Colorado River water is diverted from agriculture to lithium extraction, this would contribute to the shrinking of the sea.

Freshwater consumption for lithium may also limit Salton Sea restoration options, such as the voluntary transfer of Colorado River water to the sea by incentivizing fallowed agricultural fields (Suri et al., 2022). It is also important to note that CTR holds mineral leases beyond the current shoreline, meaning future



The health of the Salton Sea is a delicate issue in the Lithium Valley region. The Sea can benefit from restoration projects funded by the lithium excise tax, but local communities are worried about extraction exacerbating the decline of the Sea.

Photo: Comite Civico del Valle

expansion of lithium projects may, to some extent, depend on the continued shrinking of the sea (Imperial Irrigation District, 2016).

Reduced inflow to the Salton Sea would likely have an indirect impact on air quality. As previously noted, Imperial Valley already faces many natural and anthropogenic (human caused) sources of air pollution, as shown in Figure 10 (Frie et al., 2019). As the Salton Sea shrinks, exposed lake bed (playa) represents an increased threat to air quality in the valley, as shown in Figure 11 (Frie et al., 2017). Years of agricultural runoff have deposited chemicals from pesticides and fertilizers in the playa sediment, and further reduction in surface water in the Salton Sea will increase emissions from exposed playa, namely, magnesium, sulfates, calcium, and strontium. These represent potential indirect emissions from lithium extraction, which should be analyzed and mitigated in a cumulative impacts analysis.

Some of the pollution impacts to the Salton Sea could be offset through restoration projects funded by California's lithium excise tax, 20% of which goes towards the Salton Sea Restoration Fund.

However, it is possible that some of these impacts to the Salton Sea could be offset through restoration projects funded by California's lithium excise tax, 20% of which goes towards the Salton Sea Restoration Fund.

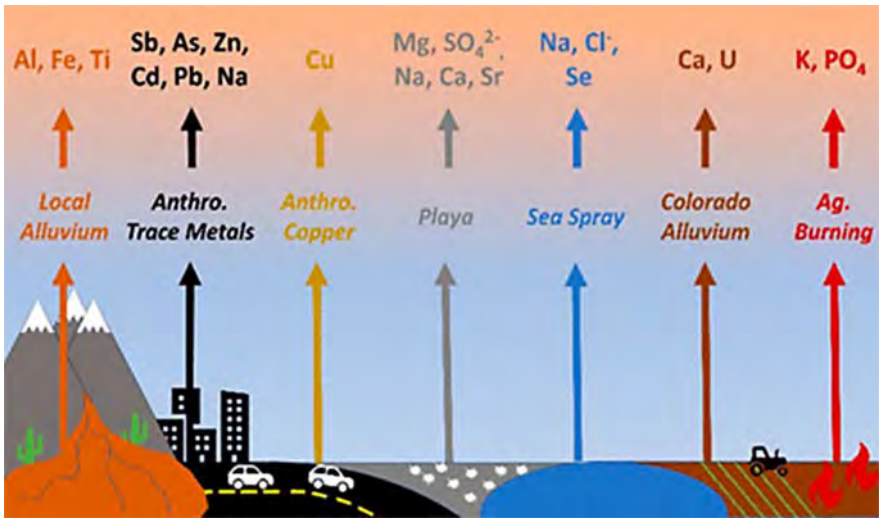


FIGURE 10: Sources of air pollution in Imperial Valley.

From Frie et al., 2019

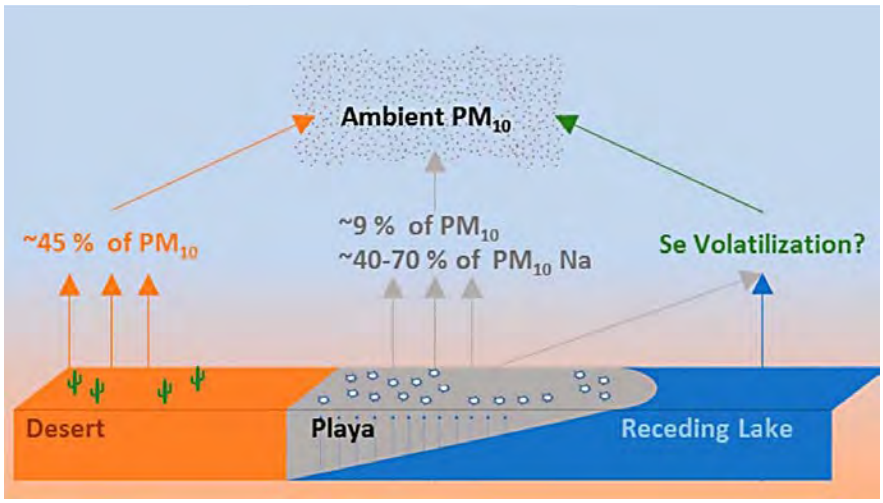


FIGURE 11: As the Salton Sea shrinks, the exposed lake bed (playa) allows contaminated dust to pollute the air with particulate pollution (PM_{10}).

From Frie et al., 2017

Hazardous Waste and Materials

Waste produced from geothermal power generation and DLE can be minimized by reinjecting spent brine deep underground back into the geothermal reservoir, in what project proponents refer to as a "closed loop." However, some solid wastes need to be managed, including arsenic, lead, iron, and silica.

Currently, geothermal operations at the Salton Sea remove iron and silica from brine before it is reinjected to prevent clogging injection wells. Iron and silica are precipitated as solid waste on filter cakes, which may also include hazardous elements from the brine such as arsenic and lead. This solid waste is tested to determine whether it is hazardous or not. BHER sends non-hazardous waste from its 10 geothermal plants to the Desert Valley Company Monofill in Imperial Valley, roughly 15 miles west of Westmorland. The 180-acre facility accepts 750 tons of Class II non-hazardous waste per day, and was recently approved to expand its disposal capacity, extending its lifetime from 2025 to 2080 (BRG Consulting, 2021). While the majority of geothermal waste is considered non-hazardous, BHER operations have been fined for improper storage, treatment, and disposal of hazardous waste, as well as discharge of wastewater with elevated levels of lead, arsenic, and copper into the Salton Sea (Cagle, 2010).

Though solid waste is tested to determine if it is hazardous, operations have been fined for improper storage, treatment, and disposal of hazardous waste, and for discharge of wastewater with elevated levels of lead, arsenic, and copper into the Salton Sea.

The addition of lithium extraction and processing on-site at geothermal plants will introduce other waste and hazardous materials.

While waste products from each DLE project will be different, the ES Minerals project can be used to better understand potential impacts. Five waste streams are identified in the ES Minerals ATLiS project EIR and associated patent:

1. **Iron (Fe) / Silica (Si) filter cake** — The Fe/Si filter cake is currently produced as part of the flash steam process and clarification (primary and secondary) of the geothermal brine. This occurs independent of lithium extraction and is a necessary step to prevent scaling and maintain power plant equipment. The Fe/Si filter cake can also contain arsenic, barium, and lead, which are harmful to human health.

2. **Calcium (Ca) / Magnesium (Mg) filter cake** — The Ca/Mg filter cake would be added as part of the process of lithium extraction. Calcium and magnesium represent a major part of the dissolved minerals in the Salton Sea geothermal brine and must be removed as part of the lithium extraction process. This is done using caustic soda (sodium hydroxide) to remove calcium and magnesium which are filtered out as hydroxides. The fate of this waste is not explicitly stated. Calcium and magnesium hydroxides can be a source of water pollution impacting pH and water hardness.

3. **Boron Ion Exchange** — Boron (B) is removed using ion exchange. The resulting waste is cycled back through the Ca/Mg precipitation process and the countercurrent ion exchange. However, the fate of the boron waste is not specified. In high concentrations boron can be toxic to plants and animals.

4. **Manganese (Mn) / Zinc (Zn) filter cake** — The Magnesium and zinc filter cake is related to the mineral extraction process and may or may not be a waste stream. Magnesium and zinc can be separated from the brine, but during the process, there are removals of other unidentified "impurities" that need to be accounted for.

5. **Residual Brine** — Residual brine is currently a waste stream of geothermal energy exploitation, but its composition would be modified with the addition of lithium extraction to the process. The residual brine would be reinjected into the geothermal reservoir.

ES Minerals plans to minimize waste by selling the Iron/Silica and Magnesium/Zinc byproducts to third-party buyers for other industrial processes. However, it is not clear if they currently have a feasible market for these products. If not sold, they will have to be managed as waste.

Some of these waste streams will contain hazardous materials. The ES Minerals EIR states that it will test materials before disposal and any hazardous materials will be disposed of at the appropriate disposal sites. They expect 90% of their waste (37,602 cubic yards) to be disposed of at the Burrtec non-hazardous landfill in Salton City. The hazardous remaining 10% (4,178 cubic yards) would be disposed of at the Copper Mountain Landfill in Wellton, Arizona. If the waste does not meet Arizona standards, it will be disposed of at an unspecified site in Nevada.

Recently, California has been criticized by environmental justice advocates for the practice of transporting hazardous waste to dump in non-hazardous facilities in states with lower standards, such as Arizona (Lewis, 2023). Greater waste transportation distances should also be factored into emissions accounting. Published values of the filter cake mineral concentrations and totals should be available and easily accessible to the public.

Waste streams from the other DLE projects will likely be similar to ES Minerals, but will require their own analysis. The Salton Sea geothermal brine contains a wide range of elements. Until waste stream concentrations and total mass are published by companies or regulatory agencies, it should be assumed that any one of these constituents could be found in the waste stream. In theory, the dissolved minerals would be reinjected back into the geothermal reservoir, and certain processes (crystallizers, clarifiers, and refining) would create solid wastes. While most of the minerals are not a direct threat to human health when dissolved in the geothermal brine, the extraction and refining processes could increase the concentration levels.

The concentrations of heavy metals such as arsenic, lead, and cadmium are of particular concern, as well as any naturally occurring radioactive materials.

The concentrations of heavy metals such as arsenic, lead, and cadmium are of particular concern, as well as any naturally occurring radioactive materials. Naturally occurring radioactive minerals do exist at low levels in the SSKGRA (Finster et al., 2015). The ES Minerals patent refers to a process for preventing the precipitation of radioactive earth metal salts (Featherstone et al., 2020). While this process is expected to continue, the addition of the Ca/Mg precipitation (both alkaline earth metals) may cause other alkaline earth metals to precipitate as they chemically react in ways similar to Ca/Mg. This is a theoretical risk pathway that has not been fully explored but could pose a risk primarily to plant, transportation, and disposal workers who work closely with this waste material for extended periods. This risk should be monitored and mitigated if lithium extraction moves forward.

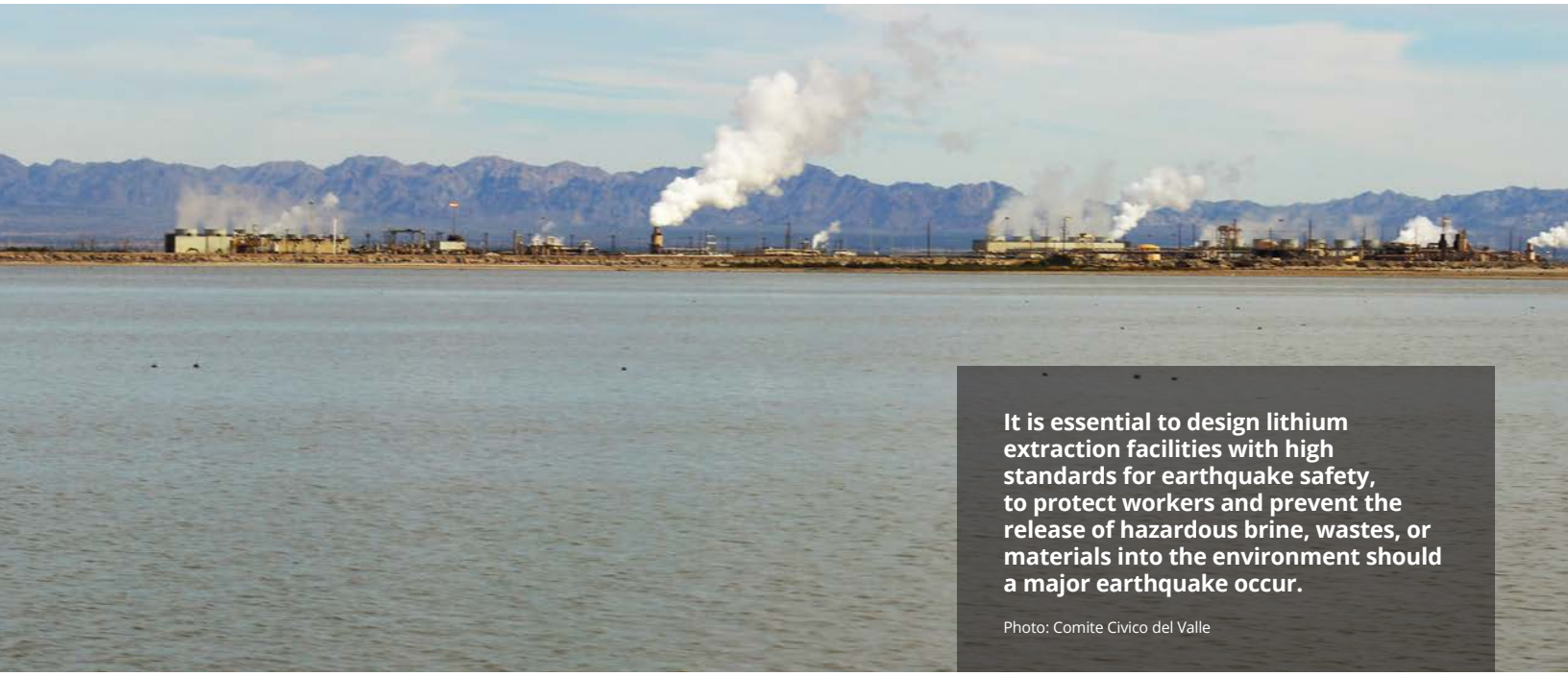
In addition to waste streams, DLE projects will use other hazardous materials in the process, such as organic solvents and sulfuric acid. Industrial complexes can work with and responsibly manage hazardous wastes and materials, but transparency and accountability are essential.

Seismic Activity

DLE from geothermal brine using current technologies, according to the best available science, will not directly affect seismic activity. However, successful lithium extraction may make geothermal power more profitable, leading to an expansion of geothermal wells throughout the SSKGRA. If drilling and maintenance of additional wells uses EGS, then it may have an impact on seismic activity. The science behind seismic risk assessment of geothermal exploitation is growing and improving, but there is still uncertainty and disagreement among scientists about the actual hazards and risks associated with EGS.

Evidence supports the theory that EGS increases the frequency of earthquakes lower than magnitude 4, also known as microquakes (Majer et al., 2007). There is emerging evidence that EGS-induced microquakes can actually reduce overall seismic risk by helping to release shear stress on the fault, thus reducing the number of high-magnitude earthquakes (Im & Avouac, 2021). There is also some evidence showing that EGS can cause earthquakes up to magnitude 5.5 with the potential for larger earthquakes (Woo et al., 2019). However, EGS and geothermal exploitation occur in areas that are already prone to earthquakes. Regardless of geothermal exploration, the areas are already at risk of earthquakes, and proximity to major faults will still be the major risk factor, with or without EGS.

Geothermal power plants have been operating safely in Imperial Valley for more than 40 years. While the exact impact of geothermal exploitation on inducing seismic activity requires more research, it is important to put this in context. Imperial Valley is currently living with a risk of major earthquakes given its proximity to the San Andreas Fault, and this risk is present with or without new lithium extraction and geothermal energy. This means it will be essential to design lithium extraction facilities with high standards for earthquake safety, to protect workers and prevent the release of hazardous brine, wastes, or materials into the environment should a major earthquake occur.



It is essential to design lithium extraction facilities with high standards for earthquake safety, to protect workers and prevent the release of hazardous brine, wastes, or materials into the environment should a major earthquake occur.

Photo: Comite Civico del Valle

Conclusion

The potential environmental impacts of DLE from geothermal brine in Imperial Valley reviewed in this report may prove to be less detrimental than traditional hardrock and evaporative lithium extraction processes. However, there are still potential adverse impacts that should be avoided and mitigated.

1. **Air pollution from direct lithium extraction will likely be below legal thresholds, but cumulative impacts still need to be addressed to protect public health.**
2. **Freshwater consumption may be a limiting factor on the lithium industry, and contribute to Salton Sea degradation and poor air quality from the exposed lake bed.**
3. **Hazardous and non-hazardous solid wastes need to be managed properly.**
4. **Facilities should be designed with high standards for seismic safety.**

Poor air quality already poses a health risk to the community and the release of additional pollutants should be addressed within this context. While emissions of air pollutants from DLE are likely to be below legal thresholds of significance that require mitigation, they may approach these thresholds. Emissions should be continually monitored, and air quality plans should be adapted as needed to protect public health. Of particular concern will be monitoring the cumulative impacts to air quality of building out the entirety of "Lithium Valley," including not just construction and operation of geothermal lithium extraction facilities but also vehicle trips, battery plants, and other associated infrastructure.

DLE and new geothermal power plants will consume significant amounts of freshwater, and the growth of the industry may be limited by availability of Colorado River water. If water is prioritized for lithium development instead of agriculture or Salton Sea restoration, this could lead to an indirect effect on air quality by speeding up the shrinking of the Sea and leading to an increase in airborne playa dust, which is harmful to human health. Given the impacts of climate change, it will be important for Imperial County and Imperial Irrigation District to plan for a future of reduced Colorado River use, and the trade-offs involved in how water is allocated should be carefully considered.

DLE projects may minimize waste by reinjecting spent brine into the geothermal reservoir and successfully marketing other brine components, such as silica, manganese, and zinc. However, both hazardous and non-hazardous solid wastes will be produced that need to be managed properly. Measures should be taken to prevent spills and contamination. Waste contents should be monitored closely, and the practice of transporting hazardous waste out of state scrutinized from an environmental justice perspective.

DLE projects are unlikely to have a direct impact on seismic activity. However, if new geothermal wells are drilled using EGS, that may have an effect on inducing seismicity that requires further study and regulation. Imperial Valley is already living with a significant risk of earthquakes, and so facilities should be designed with high standards for seismic safety.

For far too long, the Salton Sea has been written off as an unsolvable disaster, with Imperial Valley as a perpetual sacrifice zone. This cannot be the case moving forward.

To address climate change, we must transition as quickly as possible to renewable energy. But in order to achieve a just and equitable energy transition, we cannot create new sacrifice zones for lithium mining.

Past harms must be remedied, Indigenous communities' right to FPIC respected, and frontline communities must have a seat at the decision-making table, and receive benefits, rather than continued harm, from any new development.

Policies to boost recycling of lithium and require smaller battery size can help reduce the burden on mining-impacted communities. Where new lithium extraction does occur, we have an opportunity to avoid repeating the harms of the past, and instead meet the highest standards for human rights and environmental protection. Imperial Valley has an opportunity to be a leader by pursuing DLE with due diligence, responsibly heeding the concerns of frontline communities, and ensuring they equitably benefit from this transition.

Photo: Comite Civico del Valle

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Photo: Comite Civico del Valle

Earthjustice

Batch 3 of Attachments to Scoping Comments on Proposed Lithium Valley Specific Plan and Program Environmental Impact Report

Feb. 20, 2024

Current Nonattainment Counties for All Criteria Pollutants

Data is current as of January 31, 2024

The 8-hour Ozone (1997) standard was revoked on April 6, 2015 and the 1-hour Ozone (1979) standard was revoked on June 15, 2005.
The asterisk (*) indicates only a portion of the county is included in the designated nonattainment area (NA).

Download National Dataset of all designated areas (currently nonattainment, maintenance, revoked):
dbf | xls | Data dictionary (PDF)

Listed by State, County, NAAQS * Part County NA NA Area Name (Classification, if applicable)

ALASKA
Fairbanks North Star Borough
PM-2.5 (2006) *Fairbanks, AK - (Serious)
ARIZONA
Cochise County
PM-10 (1987) *Cochise County; Paul Spur/Douglas planning area, AZ - (Moderate)
Gila County
Lead (2008) *Hayden, AZ
PM-10 (1987) *Hayden, AZ - (Moderate)
PM-10 (1987) *Miami, AZ - (Moderate)
Sulfur Dioxide (2010) *Hayden, AZ
Sulfur Dioxide (2010) *Miami, AZ
8-Hour Ozone (2015) *Phoenix-Mesa, AZ - (Moderate)
Maricopa County
PM-10 (1987) *Maricopa and Pinal Counties; Phoenix planning area, AZ - (Serious)
8-Hour Ozone (2008) *Phoenix-Mesa, AZ - (Moderate)
8-Hour Ozone (2015) *Phoenix-Mesa, AZ - (Moderate)
Pima County
PM-10 (1987) *Pima County; Rillito planning area, AZ - (Moderate)
Pinal County
Lead (2008) *Hayden, AZ
PM-10 (1987) *Hayden, AZ - (Moderate)
PM-10 (1987) *Maricopa and Pinal Counties; Phoenix planning area, AZ - (Serious)
PM-10 (1987) *Miami, AZ - (Moderate)
PM-10 (1987) *Pinal County (part); West Pinal, AZ - (Serious)
PM-2.5 (2006) *West Central Pinal, AZ - (Moderate)
Sulfur Dioxide (1971) *Hayden (Pinal County), AZ
Sulfur Dioxide (2010) *Hayden, AZ
8-Hour Ozone (2008) *Phoenix-Mesa, AZ - (Moderate)
8-Hour Ozone (2015) *Phoenix-Mesa, AZ - (Moderate)
Santa Cruz County
PM-10 (1987) *Santa Cruz County; Nogales planning area, AZ - (Moderate)
Yuma County
PM-10 (1987) *Yuma, AZ - (Moderate)
8-Hour Ozone (2015) *Yuma, AZ - (Marginal)
CALIFORNIA
Alameda County
PM-2.5 (2006) San Francisco Bay Area, CA - (Moderate)

8-Hour Ozone (2008) San Francisco Bay Area, CA - (Marginal)
8-Hour Ozone (2015) San Francisco Bay Area, CA - (Marginal)

Amador County
8-Hour Ozone (2015) Amador County, CA - (Marginal)

Butte County
8-Hour Ozone (2008) Chico (Butte County), CA - (Marginal)
8-Hour Ozone (2015) Butte County, CA - (Marginal)

Calaveras County
8-Hour Ozone (2008) Calaveras County, CA - (Marginal)
8-Hour Ozone (2015) Calaveras County, CA - (Marginal)

Contra Costa County
PM-2.5 (2006) San Francisco Bay Area, CA - (Moderate)
8-Hour Ozone (2008) San Francisco Bay Area, CA - (Marginal)
8-Hour Ozone (2015) San Francisco Bay Area, CA - (Marginal)

El Dorado County
PM-2.5 (2006) *Sacramento, CA - (Moderate)
8-Hour Ozone (2008) *Sacramento Metro, CA - (Severe 15)
8-Hour Ozone (2015) *Sacramento Metro, CA - (Serious)

Fresno County
PM-2.5 (1997) San Joaquin Valley, CA - (Serious)
PM-2.5 (2006) San Joaquin Valley, CA - (Serious)
PM-2.5 (2012) San Joaquin Valley, CA - (Serious)
8-Hour Ozone (2008) San Joaquin Valley, CA - (Extreme)
8-Hour Ozone (2015) San Joaquin Valley, CA - (Extreme)

Imperial County
PM-2.5 (2006) *Imperial County, CA - (Moderate)
PM-2.5 (2012) *Imperial County, CA - (Moderate)
8-Hour Ozone (2008) Imperial County, CA - (Moderate)
8-Hour Ozone (2015) Imperial County, CA - (Marginal)

Inyo County
PM-10 (1987) *Inyo County; Owens Valley planning area, CA - (Serious)

Kern County
PM-10 (1987) *East Kern County, CA - (Serious)
PM-2.5 (1997) *San Joaquin Valley, CA - (Serious)
PM-2.5 (2006) *San Joaquin Valley, CA - (Serious)
PM-2.5 (2012) *San Joaquin Valley, CA - (Serious)
8-Hour Ozone (2008) *Kern County (Eastern Kern), CA - (Severe 15)
8-Hour Ozone (2008) *San Joaquin Valley, CA - (Extreme)
8-Hour Ozone (2015) *Kern County (Eastern Kern), CA - (Serious)
8-Hour Ozone (2015) *San Joaquin Valley, CA - (Extreme)

Kings County
PM-2.5 (1997) San Joaquin Valley, CA - (Serious)
PM-2.5 (2006) San Joaquin Valley, CA - (Serious)
PM-2.5 (2012) San Joaquin Valley, CA - (Serious)
8-Hour Ozone (2008) San Joaquin Valley, CA - (Extreme)
8-Hour Ozone (2015) San Joaquin Valley, CA - (Extreme)

Los Angeles County
Lead (2008) *Los Angeles County-South Coast Air Basin, CA
PM-2.5 (1997) *Los Angeles-South Coast Air Basin, CA - (Moderate)
PM-2.5 (2006) *Los Angeles-South Coast Air Basin, CA - (Serious)
PM-2.5 (2012) *Los Angeles-South Coast Air Basin, CA - (Serious)
8-Hour Ozone (2008) *Los Angeles-San Bernardino Counties (West Mojave Desert), CA - (Severe 15)
8-Hour Ozone (2008) *Los Angeles-South Coast Air Basin, CA - (Extreme)
8-Hour Ozone (2015) *Los Angeles-San Bernardino Counties (West Mojave Desert), CA - (Severe 15)
8-Hour Ozone (2015) *Los Angeles-South Coast Air Basin, CA - (Extreme)

Madera County
PM-2.5 (1997) San Joaquin Valley, CA - (Serious)
PM-2.5 (2006) San Joaquin Valley, CA - (Serious)
PM-2.5 (2012) San Joaquin Valley, CA - (Serious)

8-Hour Ozone (2008) San Joaquin Valley, CA - (Extreme)
8-Hour Ozone (2015) San Joaquin Valley, CA - (Extreme)

Marin County
PM-2.5 (2006) San Francisco Bay Area, CA - (Moderate)
8-Hour Ozone (2008) San Francisco Bay Area, CA - (Marginal)
8-Hour Ozone (2015) San Francisco Bay Area, CA - (Marginal)

Mariposa County
8-Hour Ozone (2008) Mariposa County, CA - (Moderate)
8-Hour Ozone (2015) Mariposa County, CA - (Moderate)

Merced County
PM-2.5 (1997) San Joaquin Valley, CA - (Serious)
PM-2.5 (2006) San Joaquin Valley, CA - (Serious)
PM-2.5 (2012) San Joaquin Valley, CA - (Serious)
8-Hour Ozone (2008) San Joaquin Valley, CA - (Extreme)
8-Hour Ozone (2015) San Joaquin Valley, CA - (Extreme)

Mono County
PM-10 (1987) *Mono Basin, CA - (Moderate)

Napa County
PM-2.5 (2006) San Francisco Bay Area, CA - (Moderate)
8-Hour Ozone (2008) San Francisco Bay Area, CA - (Marginal)
8-Hour Ozone (2015) San Francisco Bay Area, CA - (Marginal)

Nevada County
8-Hour Ozone (2008) *Nevada County (Western part), CA - (Serious)
8-Hour Ozone (2015) *Nevada County (Western part), CA - (Serious)

Orange County
PM-2.5 (1997) Los Angeles-South Coast Air Basin, CA - (Moderate)
PM-2.5 (2006) Los Angeles-South Coast Air Basin, CA - (Serious)
PM-2.5 (2012) Los Angeles-South Coast Air Basin, CA - (Serious)
8-Hour Ozone (2008) Los Angeles-South Coast Air Basin, CA - (Extreme)
8-Hour Ozone (2015) Los Angeles-South Coast Air Basin, CA - (Extreme)

Placer County
PM-2.5 (2006) *Sacramento, CA - (Moderate)
8-Hour Ozone (2008) *Sacramento Metro, CA - (Severe 15)
8-Hour Ozone (2015) *Sacramento Metro, CA - (Serious)

Plumas County
PM-2.5 (2012) *Plumas County, CA - (Serious)

Riverside County
PM-10 (1987) *Riverside County; Coachella Valley planning area, CA - (Serious)
PM-2.5 (1997) *Los Angeles-South Coast Air Basin, CA - (Moderate)
PM-2.5 (2006) *Los Angeles-South Coast Air Basin, CA - (Serious)
PM-2.5 (2012) *Los Angeles-South Coast Air Basin, CA - (Serious)
8-Hour Ozone (2008) *Los Angeles-South Coast Air Basin, CA - (Extreme)
8-Hour Ozone (2008) *Morongo Band of Mission Indians, CA - (Severe 15)
8-Hour Ozone (2008) *Pechanga Band of Luiseno Mission Indians of the Pechanga Reservation, CA - (Moderate)
8-Hour Ozone (2008) *Riverside County (Coachella Valley), CA - (Extreme)
8-Hour Ozone (2015) *Los Angeles-South Coast Air Basin, CA - (Extreme)
8-Hour Ozone (2015) *Morongo Band of Mission Indians, CA - (Serious)
8-Hour Ozone (2015) *Pechanga Band of Luiseno Mission Indians of the Pechanga Reservation, CA - (Moderate)
8-Hour Ozone (2015) *Riverside County (Coachella Valley), CA - (Severe 15)

Sacramento County
PM-2.5 (2006) Sacramento, CA - (Moderate)
8-Hour Ozone (2008) Sacramento Metro, CA - (Severe 15)
8-Hour Ozone (2015) Sacramento Metro, CA - (Serious)

San Bernardino County
PM-10 (1987) *San Bernardino County, CA - (Moderate)
PM-10 (1987) *Trona, CA - (Moderate)
PM-2.5 (1997) *Los Angeles-South Coast Air Basin, CA - (Moderate)
PM-2.5 (2006) *Los Angeles-South Coast Air Basin, CA - (Serious)
PM-2.5 (2012) *Los Angeles-South Coast Air Basin, CA - (Serious)

8-Hour Ozone (2008) *Los Angeles-San Bernardino Counties (West Mojave Desert), CA - (Severe 15)
8-Hour Ozone (2008) *Los Angeles-South Coast Air Basin, CA - (Extreme)
8-Hour Ozone (2015) *Los Angeles-San Bernardino Counties (West Mojave Desert), CA - (Severe 15)
8-Hour Ozone (2015) *Los Angeles-South Coast Air Basin, CA - (Extreme)

San Diego County
8-Hour Ozone (2008) *Pechanga Band of Luiseno Mission Indians of the Pechanga Reservation, CA - (Moderate)
8-Hour Ozone (2008) *San Diego County, CA - (Severe 15)
8-Hour Ozone (2015) *Pechanga Band of Luiseno Mission Indians of the Pechanga Reservation, CA - (Moderate)
8-Hour Ozone (2015) *San Diego County, CA - (Severe 15)

San Francisco County
PM-2.5 (2006) San Francisco Bay Area, CA - (Moderate)
8-Hour Ozone (2008) San Francisco Bay Area, CA - (Marginal)
8-Hour Ozone (2015) San Francisco Bay Area, CA - (Marginal)

San Joaquin County
PM-2.5 (1997) San Joaquin Valley, CA - (Serious)
PM-2.5 (2006) San Joaquin Valley, CA - (Serious)
PM-2.5 (2012) San Joaquin Valley, CA - (Serious)
8-Hour Ozone (2008) San Joaquin Valley, CA - (Extreme)
8-Hour Ozone (2015) San Joaquin Valley, CA - (Extreme)

San Luis Obispo County
8-Hour Ozone (2008) *San Luis Obispo (Eastern San Luis Obispo), CA - (Marginal)
8-Hour Ozone (2015) *San Luis Obispo (Eastern part), CA - (Marginal)

San Mateo County
PM-2.5 (2006) San Francisco Bay Area, CA - (Moderate)
8-Hour Ozone (2008) San Francisco Bay Area, CA - (Marginal)
8-Hour Ozone (2015) San Francisco Bay Area, CA - (Marginal)

Santa Clara County
PM-2.5 (2006) San Francisco Bay Area, CA - (Moderate)
8-Hour Ozone (2008) San Francisco Bay Area, CA - (Marginal)
8-Hour Ozone (2015) San Francisco Bay Area, CA - (Marginal)

Solano County
PM-2.5 (2006) *Sacramento, CA - (Moderate)
PM-2.5 (2006) *San Francisco Bay Area, CA - (Moderate)
8-Hour Ozone (2008) *Sacramento Metro, CA - (Severe 15)
8-Hour Ozone (2008) *San Francisco Bay Area, CA - (Marginal)
8-Hour Ozone (2015) *Sacramento Metro, CA - (Serious)
8-Hour Ozone (2015) *San Francisco Bay Area, CA - (Marginal)

Sonoma County
PM-2.5 (2006) *San Francisco Bay Area, CA - (Moderate)
8-Hour Ozone (2008) *San Francisco Bay Area, CA - (Marginal)
8-Hour Ozone (2015) *San Francisco Bay Area, CA - (Marginal)

Stanislaus County
PM-2.5 (1997) San Joaquin Valley, CA - (Serious)
PM-2.5 (2006) San Joaquin Valley, CA - (Serious)
PM-2.5 (2012) San Joaquin Valley, CA - (Serious)
8-Hour Ozone (2008) San Joaquin Valley, CA - (Extreme)
8-Hour Ozone (2015) San Joaquin Valley, CA - (Extreme)

Sutter County
8-Hour Ozone (2008) *Sacramento Metro, CA - (Severe 15)
8-Hour Ozone (2015) *Sacramento Metro, CA - (Serious)
8-Hour Ozone (2015) *Sutter Buttes, CA - (Marginal)

Tehama County
8-Hour Ozone (2008) *Tuscan Buttes, CA - (Marginal)
8-Hour Ozone (2015) *Tuscan Buttes, CA - (Marginal (Rural Transport))

Tulare County
PM-2.5 (1997) San Joaquin Valley, CA - (Serious)
PM-2.5 (2006) San Joaquin Valley, CA - (Serious)

PM-2.5 (2012) San Joaquin Valley, CA - (Serious)
8-Hour Ozone (2008) San Joaquin Valley, CA - (Extreme)
8-Hour Ozone (2015) San Joaquin Valley, CA - (Extreme)

Tuolumne County
8-Hour Ozone (2015) Tuolumne County, CA - (Marginal)

Ventura County
8-Hour Ozone (2008) *Ventura County, CA - (Serious)
8-Hour Ozone (2015) *Ventura County, CA - (Serious)

Yolo County
PM-2.5 (2006) *Sacramento, CA - (Moderate)
8-Hour Ozone (2008) Sacramento Metro, CA - (Severe 15)
8-Hour Ozone (2015) Sacramento Metro, CA - (Serious)

COLORADO

Adams County
8-Hour Ozone (2008) Denver-Boulder-Greeley-Ft. Collins-Loveland, CO - (Severe 15)
8-Hour Ozone (2015) Denver Metro/North Front Range, CO - (Moderate)

Arapahoe County
8-Hour Ozone (2008) Denver-Boulder-Greeley-Ft. Collins-Loveland, CO - (Severe 15)
8-Hour Ozone (2015) Denver Metro/North Front Range, CO - (Moderate)

Boulder County
8-Hour Ozone (2008) Denver-Boulder-Greeley-Ft. Collins-Loveland, CO - (Severe 15)
8-Hour Ozone (2015) Denver Metro/North Front Range, CO - (Moderate)

Broomfield County
8-Hour Ozone (2008) Denver-Boulder-Greeley-Ft. Collins-Loveland, CO - (Severe 15)
8-Hour Ozone (2015) Denver Metro/North Front Range, CO - (Moderate)

Denver County
8-Hour Ozone (2008) Denver-Boulder-Greeley-Ft. Collins-Loveland, CO - (Severe 15)
8-Hour Ozone (2015) Denver Metro/North Front Range, CO - (Moderate)

Douglas County
8-Hour Ozone (2008) Denver-Boulder-Greeley-Ft. Collins-Loveland, CO - (Severe 15)
8-Hour Ozone (2015) Denver Metro/North Front Range, CO - (Moderate)

Jefferson County
8-Hour Ozone (2008) Denver-Boulder-Greeley-Ft. Collins-Loveland, CO - (Severe 15)
8-Hour Ozone (2015) Denver Metro/North Front Range, CO - (Moderate)

Larimer County
8-Hour Ozone (2008) *Denver-Boulder-Greeley-Ft. Collins-Loveland, CO - (Severe 15)
8-Hour Ozone (2015) *Denver Metro/North Front Range, CO - (Moderate)

Weld County
8-Hour Ozone (2008) *Denver-Boulder-Greeley-Ft. Collins-Loveland, CO - (Severe 15)
8-Hour Ozone (2015) Denver Metro/North Front Range, CO - (Moderate)

CONNECTICUT

Fairfield County
8-Hour Ozone (2008) New York-N. New Jersey-Long Island, NY-NJ-CT - (Severe 15)
8-Hour Ozone (2015) New York-Northern New Jersey-Long Island, NY-NJ-CT - (Moderate)

Hartford County
8-Hour Ozone (2008) Greater Connecticut, CT - (Serious)
8-Hour Ozone (2015) Greater Connecticut, CT - (Moderate)

Litchfield County
8-Hour Ozone (2008) Greater Connecticut, CT - (Serious)
8-Hour Ozone (2015) Greater Connecticut, CT - (Moderate)

Middlesex County
8-Hour Ozone (2008) New York-N. New Jersey-Long Island, NY-NJ-CT - (Severe 15)
8-Hour Ozone (2015) New York-Northern New Jersey-Long Island, NY-NJ-CT - (Moderate)

New Haven County
8-Hour Ozone (2008) New York-N. New Jersey-Long Island, NY-NJ-CT - (Severe 15)
8-Hour Ozone (2015) New York-Northern New Jersey-Long Island, NY-NJ-CT - (Moderate)

New London County
8-Hour Ozone (2008) Greater Connecticut, CT - (Serious)
8-Hour Ozone (2015) Greater Connecticut, CT - (Moderate)

Tolland County
8-Hour Ozone (2008) Greater Connecticut, CT - (Serious)

8-Hour Ozone (2015) Greater Connecticut, CT - (Moderate)
Windham County
8-Hour Ozone (2008) Greater Connecticut, CT - (Serious)
8-Hour Ozone (2015) Greater Connecticut, CT - (Moderate)

DELAWARE
New Castle County
8-Hour Ozone (2008) Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE - (Marginal)
8-Hour Ozone (2015) Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE - (Moderate)
Sussex County
8-Hour Ozone (2008) Seaford, DE - (Marginal)

DISTRICT OF COLUMBIA
District of Columbia
8-Hour Ozone (2015) Washington, DC-MD-VA - (Moderate)

GUAM
Guam
*Sulfur Dioxide (1971)**Piti, GU
*Sulfur Dioxide (1971)**Tanguisson, GU
*Sulfur Dioxide (2010)**Piti-Cabras, GU

IDAHO
Bannock County
PM-10 (1987) *Power-Bannock Counties; Fort Hall Indian Reservation, ID - (Moderate)
Power County
PM-10 (1987) *Power-Bannock Counties; Fort Hall Indian Reservation, ID - (Moderate)

ILLINOIS
Cook County
8-Hour Ozone (2015) Chicago, IL-IN-WI - (Moderate)
DuPage County
8-Hour Ozone (2015) Chicago, IL-IN-WI - (Moderate)
Grundy County
8-Hour Ozone (2015) *Chicago, IL-IN-WI - (Moderate)
Kane County
8-Hour Ozone (2015) Chicago, IL-IN-WI - (Moderate)
Kendall County
8-Hour Ozone (2015) *Chicago, IL-IN-WI - (Moderate)
Lake County
8-Hour Ozone (2015) Chicago, IL-IN-WI - (Moderate)
Madison County
*Sulfur Dioxide (2010)**Alton Township, IL
8-Hour Ozone (2015) St. Louis, MO-IL - (Moderate)
McHenry County
8-Hour Ozone (2015) Chicago, IL-IN-WI - (Moderate)
Monroe County
8-Hour Ozone (2015) St. Louis, MO-IL - (Moderate)
St. Clair County
8-Hour Ozone (2015) St. Louis, MO-IL - (Moderate)
Will County
8-Hour Ozone (2015) Chicago, IL-IN-WI - (Moderate)

INDIANA
Huntington County
*Sulfur Dioxide (2010)**Huntington, IN
Lake County
8-Hour Ozone (2015) *Chicago, IL-IN-WI - (Moderate)
Porter County
8-Hour Ozone (2015) *Chicago, IL-IN-WI - (Moderate)

IOWA
Muscatine County
*Sulfur Dioxide (2010)**Muscatine, IA

KANSAS
Saline County
Lead (2008) *Saline County, KS

KENTUCKY

Bullitt County
8-Hour Ozone (2015) Louisville, KY-IN - (Moderate)
Henderson County
*Sulfur Dioxide (2010)** Henderson-Webster Counties, KY
Jefferson County
8-Hour Ozone (2015) Louisville, KY-IN - (Moderate)
Oldham County
8-Hour Ozone (2015) Louisville, KY-IN - (Moderate)
Webster County
*Sulfur Dioxide (2010)** Henderson-Webster Counties, KY

LOUISIANA

Evangeline Parish
*Sulfur Dioxide (2010)** Evangeline Parish (Partial), LA
St. Bernard Parish
Sulfur Dioxide (2010) St. Bernard Parish, LA

MARYLAND

Anne Arundel County
*Sulfur Dioxide (2010)** Anne Arundel County and Baltimore County, MD
8-Hour Ozone (2008) Baltimore, MD - (Moderate)
8-Hour Ozone (2015) Baltimore, MD - (Moderate)
Baltimore County
*Sulfur Dioxide (2010)** Anne Arundel County and Baltimore County, MD
8-Hour Ozone (2008) Baltimore, MD - (Moderate)
8-Hour Ozone (2015) Baltimore, MD - (Moderate)
Baltimore city
8-Hour Ozone (2008) Baltimore, MD - (Moderate)
8-Hour Ozone (2015) Baltimore, MD - (Moderate)
Calvert County
8-Hour Ozone (2015) Washington, DC-MD-VA - (Moderate)
Carroll County
8-Hour Ozone (2008) Baltimore, MD - (Moderate)
8-Hour Ozone (2015) Baltimore, MD - (Moderate)
Cecil County
8-Hour Ozone (2008) Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE - (Marginal)
8-Hour Ozone (2015) Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE - (Moderate)
Charles County
8-Hour Ozone (2015) Washington, DC-MD-VA - (Moderate)
Frederick County
8-Hour Ozone (2015) Washington, DC-MD-VA - (Moderate)
Harford County
8-Hour Ozone (2008) Baltimore, MD - (Moderate)
8-Hour Ozone (2015) Baltimore, MD - (Moderate)
Howard County
8-Hour Ozone (2008) Baltimore, MD - (Moderate)
8-Hour Ozone (2015) Baltimore, MD - (Moderate)
Montgomery County
8-Hour Ozone (2015) Washington, DC-MD-VA - (Moderate)
Prince George's County
8-Hour Ozone (2015) Washington, DC-MD-VA - (Moderate)

MASSACHUSETTS

Dukes County
8-Hour Ozone (2008) Dukes County, MA - (Marginal)

MICHIGAN

Allegan County
*8-Hour Ozone (2015)** Allegan County, MI - (Moderate)
Berrien County
8-Hour Ozone (2015) Berrien County, MI - (Moderate)
Muskegon County
*8-Hour Ozone (2015)** Muskegon County, MI - (Moderate)
St. Clair County
*Sulfur Dioxide (2010)** St. Clair, MI

Wayne County
Sulfur Dioxide (2010) *Detroit, MI

MINNESOTA
Dakota County
Lead (2008) *Eagan, MN

MISSOURI
Dent County
Lead (2008) *Iron, Dent, and Reynolds Counties, MO
Franklin County
8-Hour Ozone (2015) *St. Louis, MO-IL - (Moderate)
Iron County
Lead (2008) *Iron, Dent, and Reynolds Counties, MO
Jefferson County
Lead (1978) *Jefferson County (part); Herculaneum, MO
Lead (2008) *Jefferson County, MO
8-Hour Ozone (2015) St. Louis, MO-IL - (Moderate)
New Madrid County
Sulfur Dioxide (2010) *New Madrid County, MO
Reynolds County
Lead (2008) *Iron, Dent, and Reynolds Counties, MO
St. Charles County
8-Hour Ozone (2015) St. Louis, MO-IL - (Moderate)
St. Louis County
8-Hour Ozone (2015) St. Louis, MO-IL - (Moderate)
St. Louis city
8-Hour Ozone (2015) St. Louis, MO-IL - (Moderate)

MONTANA
Lake County
PM-10 (1987) *Lake County; Polson, MT - (Moderate)
PM-10 (1987) *Lake County; Ronan, MT - (Moderate)
Rosebud County
PM-10 (1987) *Rosebud County; Lame Deer, MT - (Moderate)
Yellowstone County
Sulfur Dioxide (1971) *Laurel Area (Yellowstone County), MT

NEVADA
Clark County
8-Hour Ozone (2015) *Las Vegas, NV - (Moderate)

NEW JERSEY
Atlantic County
8-Hour Ozone (2008) Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE - (Marginal)
8-Hour Ozone (2015) Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE - (Moderate)
Bergen County
8-Hour Ozone (2008) New York-N. New Jersey-Long Island, NY-NJ-CT - (Severe 15)
8-Hour Ozone (2015) New York-Northern New Jersey-Long Island, NY-NJ-CT - (Moderate)
Burlington County
8-Hour Ozone (2008) Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE - (Marginal)
8-Hour Ozone (2015) Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE - (Moderate)
Camden County
8-Hour Ozone (2008) Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE - (Marginal)
8-Hour Ozone (2015) Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE - (Moderate)
Cape May County
8-Hour Ozone (2008) Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE - (Marginal)
8-Hour Ozone (2015) Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE - (Moderate)
Cumberland County
8-Hour Ozone (2008) Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE - (Marginal)
8-Hour Ozone (2015) Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE - (Moderate)
Essex County
8-Hour Ozone (2008) New York-N. New Jersey-Long Island, NY-NJ-CT - (Severe 15)
8-Hour Ozone (2015) New York-Northern New Jersey-Long Island, NY-NJ-CT - (Moderate)
Gloucester County
8-Hour Ozone (2008) Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE - (Marginal)

8-Hour Ozone (2015) Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE - (Moderate)

Hudson County
8-Hour Ozone (2008) New York-N. New Jersey-Long Island, NY-NJ-CT - (Severe 15)
8-Hour Ozone (2015) New York-Northern New Jersey-Long Island, NY-NJ-CT - (Moderate)

Hunterdon County
8-Hour Ozone (2008) New York-N. New Jersey-Long Island, NY-NJ-CT - (Severe 15)
8-Hour Ozone (2015) New York-Northern New Jersey-Long Island, NY-NJ-CT - (Moderate)

Mercer County
8-Hour Ozone (2008) Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE - (Marginal)
8-Hour Ozone (2015) Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE - (Moderate)

Middlesex County
8-Hour Ozone (2008) New York-N. New Jersey-Long Island, NY-NJ-CT - (Severe 15)
8-Hour Ozone (2015) New York-Northern New Jersey-Long Island, NY-NJ-CT - (Moderate)

Monmouth County
8-Hour Ozone (2008) New York-N. New Jersey-Long Island, NY-NJ-CT - (Severe 15)
8-Hour Ozone (2015) New York-Northern New Jersey-Long Island, NY-NJ-CT - (Moderate)

Morris County
8-Hour Ozone (2008) New York-N. New Jersey-Long Island, NY-NJ-CT - (Severe 15)
8-Hour Ozone (2015) New York-Northern New Jersey-Long Island, NY-NJ-CT - (Moderate)

Ocean County
8-Hour Ozone (2008) Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE - (Marginal)
8-Hour Ozone (2015) Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE - (Moderate)

Passaic County
8-Hour Ozone (2008) New York-N. New Jersey-Long Island, NY-NJ-CT - (Severe 15)
8-Hour Ozone (2015) New York-Northern New Jersey-Long Island, NY-NJ-CT - (Moderate)

Salem County
8-Hour Ozone (2008) Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE - (Marginal)
8-Hour Ozone (2015) Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE - (Moderate)

Somerset County
8-Hour Ozone (2008) New York-N. New Jersey-Long Island, NY-NJ-CT - (Severe 15)
8-Hour Ozone (2015) New York-Northern New Jersey-Long Island, NY-NJ-CT - (Moderate)

Sussex County
8-Hour Ozone (2008) New York-N. New Jersey-Long Island, NY-NJ-CT - (Severe 15)
8-Hour Ozone (2015) New York-Northern New Jersey-Long Island, NY-NJ-CT - (Moderate)

Union County
8-Hour Ozone (2008) New York-N. New Jersey-Long Island, NY-NJ-CT - (Severe 15)
8-Hour Ozone (2015) New York-Northern New Jersey-Long Island, NY-NJ-CT - (Moderate)

Warren County
8-Hour Ozone (2008) New York-N. New Jersey-Long Island, NY-NJ-CT - (Severe 15)
8-Hour Ozone (2015) New York-Northern New Jersey-Long Island, NY-NJ-CT - (Moderate)

NEW MEXICO

Dona Ana County
PM-10 (1987) *Dona Ana County; Anthony, NM - (Moderate)
8-Hour Ozone (2015) *El Paso-Las Cruces, TX-NM - (Marginal)

NEW YORK

Bronx County
8-Hour Ozone (2008) New York-N. New Jersey-Long Island, NY-NJ-CT - (Severe 15)
8-Hour Ozone (2015) New York-Northern New Jersey-Long Island, NY-NJ-CT - (Moderate)

Chautauqua County
8-Hour Ozone (2008) Jamestown, NY - (Marginal)

Kings County
8-Hour Ozone (2008) New York-N. New Jersey-Long Island, NY-NJ-CT - (Severe 15)
8-Hour Ozone (2015) New York-Northern New Jersey-Long Island, NY-NJ-CT - (Moderate)

Nassau County
8-Hour Ozone (2008) New York-N. New Jersey-Long Island, NY-NJ-CT - (Severe 15)
8-Hour Ozone (2015) New York-Northern New Jersey-Long Island, NY-NJ-CT - (Moderate)

New York County
PM-10 (1987) New York County, NY - (Moderate)
8-Hour Ozone (2008) New York-N. New Jersey-Long Island, NY-NJ-CT - (Severe 15)
8-Hour Ozone (2015) New York-Northern New Jersey-Long Island, NY-NJ-CT - (Moderate)

Queens County

8-Hour Ozone (2008) New York-N. New Jersey-Long Island, NY-NJ-CT - (Severe 15)
8-Hour Ozone (2015) New York-Northern New Jersey-Long Island, NY-NJ-CT - (Moderate)

Richmond County
8-Hour Ozone (2008) New York-N. New Jersey-Long Island, NY-NJ-CT - (Severe 15)
8-Hour Ozone (2015) New York-Northern New Jersey-Long Island, NY-NJ-CT - (Moderate)

Rockland County
8-Hour Ozone (2008) New York-N. New Jersey-Long Island, NY-NJ-CT - (Severe 15)
8-Hour Ozone (2015) New York-Northern New Jersey-Long Island, NY-NJ-CT - (Moderate)

St. Lawrence County
*Sulfur Dioxide (2010)**St. Lawrence County, NY

Suffolk County
8-Hour Ozone (2008) New York-N. New Jersey-Long Island, NY-NJ-CT - (Severe 15)
8-Hour Ozone (2015) New York-Northern New Jersey-Long Island, NY-NJ-CT - (Moderate)

Westchester County
8-Hour Ozone (2008) New York-N. New Jersey-Long Island, NY-NJ-CT - (Severe 15)
8-Hour Ozone (2015) New York-Northern New Jersey-Long Island, NY-NJ-CT - (Moderate)

OHIO

Cuyahoga County
8-Hour Ozone (2015) Cleveland, OH - (Moderate)

Geauga County
8-Hour Ozone (2015) Cleveland, OH - (Moderate)

Lake County
8-Hour Ozone (2015) Cleveland, OH - (Moderate)

Lorain County
8-Hour Ozone (2015) Cleveland, OH - (Moderate)

Medina County
8-Hour Ozone (2015) Cleveland, OH - (Moderate)

Morgan County
*Sulfur Dioxide (2010)**Muskingum River, OH

Portage County
8-Hour Ozone (2015) Cleveland, OH - (Moderate)

Stark County
Lead (2008) *Canton-Stark County, OH

Summit County
8-Hour Ozone (2015) Cleveland, OH - (Moderate)

Washington County
*Sulfur Dioxide (2010)**Muskingum River, OH

OREGON

Klamath County
PM-2.5 (2006) *Klamath Falls, OR - (Moderate)

PENNSYLVANIA

Allegheny County
PM-2.5 (1997) *Liberty-Clairton, PA - (Moderate)
PM-2.5 (2006) *Liberty-Clairton, PA - (Moderate)
PM-2.5 (2012) Allegheny County, PA - (Moderate)
*Sulfur Dioxide (2010)**Allegheny, PA
8-Hour Ozone (2008) Pittsburgh-Beaver Valley, PA - (Marginal)

Armstrong County
*Sulfur Dioxide (1971)**Armstrong County: Madison, Mahoning, Boggs, Washington, Pine, PA
*Sulfur Dioxide (2010)**Indiana, PA
8-Hour Ozone (2008) Pittsburgh-Beaver Valley, PA - (Marginal)

Beaver County
Lead (2008) *Lower Beaver Valley, PA
*Sulfur Dioxide (2010)**Beaver, PA
8-Hour Ozone (2008) Pittsburgh-Beaver Valley, PA - (Marginal)

Berks County
Lead (2008) *Lyons, PA
Lead (2008) *North Reading, PA
8-Hour Ozone (2008) Reading, PA - (Marginal)

Bucks County
8-Hour Ozone (2008) Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE - (Marginal)

8-Hour Ozone (2015) Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE - (Moderate)
Butler County
8-Hour Ozone (2008) Pittsburgh-Beaver Valley, PA - (Marginal)
Carbon County
8-Hour Ozone (2008) Allentown-Bethlehem-Easton, PA - (Marginal)
Chester County
8-Hour Ozone (2008) Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE - (Marginal)
8-Hour Ozone (2015) Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE - (Moderate)
Delaware County
8-Hour Ozone (2008) Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE - (Marginal)
8-Hour Ozone (2015) Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE - (Moderate)
Fayette County
8-Hour Ozone (2008) Pittsburgh-Beaver Valley, PA - (Marginal)
Indiana County
Sulfur Dioxide (2010) Indiana, PA
Lancaster County
8-Hour Ozone (2008) Lancaster, PA - (Marginal)
Lehigh County
8-Hour Ozone (2008) Allentown-Bethlehem-Easton, PA - (Marginal)
Montgomery County
8-Hour Ozone (2008) Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE - (Marginal)
8-Hour Ozone (2015) Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE - (Moderate)
Northampton County
8-Hour Ozone (2008) Allentown-Bethlehem-Easton, PA - (Marginal)
Philadelphia County
8-Hour Ozone (2008) Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE - (Marginal)
8-Hour Ozone (2015) Philadelphia-Wilmington-Atlantic City, PA-NJ-MD-DE - (Moderate)
Warren County
*Sulfur Dioxide (2010)**Warren, PA
Washington County
8-Hour Ozone (2008) Pittsburgh-Beaver Valley, PA - (Marginal)
Westmoreland County
8-Hour Ozone (2008) Pittsburgh-Beaver Valley, PA - (Marginal)

PUERTO RICO
Arecibo Municipio
Lead (2008) *Arecibo, PR
Bayamon Municipio
*Sulfur Dioxide (2010)**San Juan, PR
Catano Municipio
Sulfur Dioxide (2010) San Juan, PR
Guaynabo Municipio
*Sulfur Dioxide (2010)**San Juan, PR
Salinas Municipio
*Sulfur Dioxide (2010)**Guayama-Salinas, PR
San Juan Municipio
*Sulfur Dioxide (2010)**San Juan, PR
Toa Baja Municipio
*Sulfur Dioxide (2010)**San Juan, PR

TENNESSEE
Sullivan County
*Sulfur Dioxide (2010)**Sullivan County, TN

TEXAS
Anderson County
*Sulfur Dioxide (2010)**Freestone and Anderson Counties, TX
Bexar County
8-Hour Ozone (2015) San Antonio, TX - (Moderate)
Brazoria County
8-Hour Ozone (2008) Houston-Galveston-Brazoria, TX - (Severe 15)
8-Hour Ozone (2015) Houston-Galveston-Brazoria, TX - (Moderate)
Chambers County
8-Hour Ozone (2008) Houston-Galveston-Brazoria, TX - (Severe 15)

8-Hour Ozone (2015) Houston-Galveston-Brazoria, TX - (Moderate)
Collin County
8-Hour Ozone (2008) Dallas-Fort Worth, TX - (Severe 15)
8-Hour Ozone (2015) Dallas-Fort Worth, TX - (Moderate)
Dallas County
8-Hour Ozone (2008) Dallas-Fort Worth, TX - (Severe 15)
8-Hour Ozone (2015) Dallas-Fort Worth, TX - (Moderate)
Denton County
8-Hour Ozone (2008) Dallas-Fort Worth, TX - (Severe 15)
8-Hour Ozone (2015) Dallas-Fort Worth, TX - (Moderate)
El Paso County
PM-10 (1987) *El Paso County, TX - (Moderate)
8-Hour Ozone (2015) El Paso-Las Cruces, TX-NM - (Marginal)
Ellis County
8-Hour Ozone (2008) Dallas-Fort Worth, TX - (Severe 15)
8-Hour Ozone (2015) Dallas-Fort Worth, TX - (Moderate)
Fort Bend County
8-Hour Ozone (2008) Houston-Galveston-Brazoria, TX - (Severe 15)
8-Hour Ozone (2015) Houston-Galveston-Brazoria, TX - (Moderate)
Freestone County
Sulfur Dioxide (2010) *Freestone and Anderson Counties, TX
Galveston County
8-Hour Ozone (2008) Houston-Galveston-Brazoria, TX - (Severe 15)
8-Hour Ozone (2015) Houston-Galveston-Brazoria, TX - (Moderate)
Harris County
8-Hour Ozone (2008) Houston-Galveston-Brazoria, TX - (Severe 15)
8-Hour Ozone (2015) Houston-Galveston-Brazoria, TX - (Moderate)
Howard County
Sulfur Dioxide (2010) *Howard County, TX
Hutchinson County
Sulfur Dioxide (2010) *Hutchinson County, TX
Johnson County
8-Hour Ozone (2008) Dallas-Fort Worth, TX - (Severe 15)
8-Hour Ozone (2015) Dallas-Fort Worth, TX - (Moderate)
Kaufman County
8-Hour Ozone (2008) Dallas-Fort Worth, TX - (Severe 15)
8-Hour Ozone (2015) Dallas-Fort Worth, TX - (Moderate)
Liberty County
8-Hour Ozone (2008) Houston-Galveston-Brazoria, TX - (Severe 15)
Montgomery County
8-Hour Ozone (2008) Houston-Galveston-Brazoria, TX - (Severe 15)
8-Hour Ozone (2015) Houston-Galveston-Brazoria, TX - (Moderate)
Navarro County
Sulfur Dioxide (2010) *Navarro County, TX
Panola County
Sulfur Dioxide (2010) *Rusk and Panola Counties, TX
Parker County
8-Hour Ozone (2008) Dallas-Fort Worth, TX - (Severe 15)
8-Hour Ozone (2015) Dallas-Fort Worth, TX - (Moderate)
Rockwall County
8-Hour Ozone (2008) Dallas-Fort Worth, TX - (Severe 15)
Rusk County
Sulfur Dioxide (2010) *Rusk and Panola Counties, TX
Tarrant County
8-Hour Ozone (2008) Dallas-Fort Worth, TX - (Severe 15)
8-Hour Ozone (2015) Dallas-Fort Worth, TX - (Moderate)
Titus County
Sulfur Dioxide (2010) *Titus County, TX
Waller County
8-Hour Ozone (2008) Houston-Galveston-Brazoria, TX - (Severe 15)
Wise County

8-Hour Ozone (2008) Dallas-Fort Worth, TX - (Severe 15)
8-Hour Ozone (2015) Dallas-Fort Worth, TX - (Moderate)

UTAH

Box Elder County
PM-2.5 (2006) *Salt Lake City, UT - (Serious)
Davis County
PM-2.5 (2006) Salt Lake City, UT - (Serious)
8-Hour Ozone (2015) Northern Wasatch Front, UT - (Moderate)
Duchesne County
8-Hour Ozone (2015) *Uinta Basin, UT - (Marginal)
Salt Lake County
PM-2.5 (2006) Salt Lake City, UT - (Serious)
Sulfur Dioxide (1971) Salt Lake County, UT
8-Hour Ozone (2015) Northern Wasatch Front, UT - (Moderate)
Tooele County
PM-2.5 (2006) *Salt Lake City, UT - (Serious)
Sulfur Dioxide (1971) *Tooele County, UT
8-Hour Ozone (2015) *Northern Wasatch Front, UT - (Moderate)
Uintah County
8-Hour Ozone (2015) *Uinta Basin, UT - (Marginal)
Utah County
PM-2.5 (2006) *Provo, UT - (Serious)
8-Hour Ozone (2015) *Southern Wasatch Front, UT - (Marginal)
Weber County
PM-2.5 (2006) *Salt Lake City, UT - (Serious)
8-Hour Ozone (2015) *Northern Wasatch Front, UT - (Moderate)

VIRGINIA

Alexandria city
8-Hour Ozone (2015) Washington, DC-MD-VA - (Moderate)
Arlington County
8-Hour Ozone (2015) Washington, DC-MD-VA - (Moderate)
Fairfax County
8-Hour Ozone (2015) Washington, DC-MD-VA - (Moderate)
Fairfax city
8-Hour Ozone (2015) Washington, DC-MD-VA - (Moderate)
Falls Church city
8-Hour Ozone (2015) Washington, DC-MD-VA - (Moderate)
Giles County
Sulfur Dioxide (2010) *Giles County, VA
Loudoun County
8-Hour Ozone (2015) Washington, DC-MD-VA - (Moderate)
Manassas Park city
8-Hour Ozone (2015) Washington, DC-MD-VA - (Moderate)
Manassas city
8-Hour Ozone (2015) Washington, DC-MD-VA - (Moderate)
Prince William County
8-Hour Ozone (2015) Washington, DC-MD-VA - (Moderate)

WASHINGTON

Whatcom County
Sulfur Dioxide (2010) *Whatcom County, WA

WISCONSIN

Kenosha County
8-Hour Ozone (2015) *Chicago, IL-IN-WI - (Moderate)
Milwaukee County
8-Hour Ozone (2015) Milwaukee, WI - (Moderate)
Ozaukee County
8-Hour Ozone (2015) Milwaukee, WI - (Moderate)
Racine County
8-Hour Ozone (2015) *Milwaukee, WI - (Moderate)
Sheboygan County
8-Hour Ozone (2015) *Sheboygan County, WI - (Moderate)

Washington County
8-Hour Ozone (2015) *Milwaukee, WI - (Moderate)
Waukesha County
8-Hour Ozone (2015) *Milwaukee, WI - (Moderate)

WYOMING

Lincoln County
8-Hour Ozone (2008) *Upper Green River Basin Area, WY - (Marginal)
Sublette County
8-Hour Ozone (2008) Upper Green River Basin Area, WY - (Marginal)
Sweetwater County
8-Hour Ozone (2008) *Upper Green River Basin Area, WY - (Marginal)

DECEMBER 13, 2022 | 11 MIN READ

The New Era of Biofuels Raises Environmental Concerns

To realize the potential of biofuels, the industry needs to pay attention to how feedstock crops change soil carbon

BY PETER FAIRLEY

Carinata is a crop that produces an energy-rich oil and can help to sequester carbon. Credit: Nuseed

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Russia's invasion of Ukraine is squeezing global oil supplies and inflation is jacking up prices at the pumps. Although petrol prices have started to fall in

recent months, the situation has delivered a powerful reminder of the world's dependence on fossil fuels.

It also means biofuels are having a moment. The corn-ethanol industry boasts that blending its product into petrol is saving consumers money and creating jobs in the farming communities that supply its distilleries.

Refiners producing renewable diesel fuels for long-distance lorries are expanding as fast as they can. Some are building biorefineries designed to process palm, soya and canola oils, whereas others are adding vegetable oils and animal fat to their petroleum feedstocks. Petrochemical producer Phillips 66 is investing US$850 million in its refinery in Rodeo, California, to convert it to exclusively process bio-feedstocks. And, according to market analysts, US refinery expansions that have been announced could boost the demand from biofuel manufacturers for soya bean oil beyond the country's total supply. If filling fuel tanks with these plant-derived liquids reduces carbon emissions by decreasing the demand for fossil fuels, it would help to tackle the climatic shifts that threaten humanity and biodiversity.

In principle, the sustainability of biofuels seems obvious. Carbon cycles in and out of the atmosphere as biofuel crops grow and vehicles burn the fuel they produce. But claims by industry that biofuels deliver greener transport have been battered by a relentless flow of reports. Indeed, the first-generation biofuels that are the market leaders seem to be little better for the climate than fossil fuels. A 2022 assessment[1] of the US Renewable Fuel Standard found that the programme—which requires that transportation fuel contain a minimum volume of renewable fuel, and which drives nearly half of global biofuel production—has probably increased greenhouse-gas emissions. That counter-intuitive outcome is a result of farm operations involving diesel-fuelled

tractors and fertilizers made from natural gas. The fertilizers release nitrogen oxide, a greenhouse gas that is nearly 300 times more potent than carbon dioxide. Even farm soils can release stored carbon that is essential to their resilience and fertility.

Worse still, the increase in demand for biofuel crops has extended farming onto marginal lands, damaged biodiversity and increased water use and contamination, as well as pushed up the price of agricultural commodities and thereby exacerbated food insecurity. The authors of the 2022 assessment conclude that only "profound advances" in practice and policy will make the US programme sustainable.

Agronomists, crop geneticists and carbon emission life-cycle scientists agree. To make agriculture smarter, farmers need to pay close attention to what crops work best where, and how those crops are grown. Embracing regenerative farming methods, such as reduced tilling of the soil, can retain carbon and nutrients. So, too, can planting an emerging set of winter oilseeds that can be grown seasonally between food-crop rotations. This would generate revenues that could pay for a soil-saving practice called cover cropping that few farmers have embraced so far.

"We cover crop less than 2% of our land. If you go to 40–50%, you're meeting this huge global demand for low-carbon feedstocks," says Glenn Johnston, referring to the process of growing a crop to protect and improve the soil—a crop that, in this case, can also be used to make biofuel. Johnston leads regulatory and sustainability programmes for agribusiness firm Nuseed at its research centre near Sacramento, California.

Despite this promise, the new era of biofuels still poses environmental concerns. Researchers argue that regulation needs to be much improved to

ensure that the industry arcs towards sustainability. Tracking carbon is a complex process full of pitfalls. Get it wrong and biorefineries could end up as one more environmental panacea that bites the dust.

DIGGING DEEPER

A decade ago, a transition to better biofuels seemed imminent. A new generation of commercial-scale biorefineries was coming online in the United States, Brazil and Europe. They were designed to make ethanol from fibrous cellulose-rich feedstocks such as agricultural leftovers, grasses or fast-growing trees that generally thrive on marginal farmlands and require less intensive cultivation than corn or soya beans. By now, these cellulosic biofuels made from sustainable feedstocks were supposed to be gushing into the fuels market, trimming transport emissions—the fastest-growing source of CO2 worldwide.

Alas, the flow of cellulosic fuel is barely a trickle. Processing equipment proved hard to operate, petrol prices fell and governments eased mandates designed to force the pricier cellulosic fuels into the market. “Ultimately all of those facilities struggled. Most are either producing at very low levels today or not producing at all,” says John Field, who studies the climate mitigation potential of bioenergy systems at Oak Ridge National Laboratory in Tennessee.

What didn’t stop were the generous incentives pushing food-based biofuels, and their shortcomings. Europe’s renewable energy directive drove logging and slash burning of tropical rainforests in Brazil, Indonesia and elsewhere to make way for soya bean and oil palm plantations, displacing Indigenous communities and wildlife and releasing the rainforests’ massive carbon stocks. And the carbon does not only come from the trees; even more can be released from soil as it heats up and dries. Indeed, soil holds roughly three-quarters of the organic carbon in Earth’s biosphere.

Newer programmes that tie biofuel incentives to their carbon intensity, such as California's low-carbon fuel standard, still fail to prevent unintended consequences that can come from a change in land use, says Ben Lilliston, director of rural strategies and climate change at the Institute for Agriculture and Trade Policy in Minneapolis, Minnesota. Demand for feedstocks can release carbon that is stored in forests and farm soils in ways that regulators struggle to factor in. For instance, in the past five years or so, US biorefineries have bought a growing share of US soya bean harvests. This can indirectly bump up carbon releases because soya bean producers elsewhere scale up to meet US soya demands.

The petroleum company Phillips 66's oil refinery in Rodeo, California. Credit: Steve Proehl/ Getty Images

The resulting carbon debt might never be repaid. According to a 2020 study[2], once land-use impacts are taken into consideration, the carbon intensity of

palm oil-derived biofuels is triple that of petroleum fuels.

Farming to supply biorefineries also imposes an opportunity cost because, in many cases, restoring the same land to forest or native grasses would offer greater net carbon reduction. “The typical analysis of biofuels in effect ignores this cost—it treats land as free, from a climate perspective,” says Tim Searchinger, the technical director of the food programme at Princeton University’s Center for Policy Research on Energy and the Environment in New Jersey.

The land-use and life-cycle studies required to fully account for a biofuel’s carbon footprint or saving are complex and expensive—and can yield inconvenient results for biofuels producers. Furthermore, finding reliable data isn’t easy. Soil carbon, for example, varies greatly across short distances. And variability over time means it can take up to a decade before sampling detects important changes in soil carbon. “It’s time-consuming and costly to do it right,” says Rebecca Rowe, who studies soil carbon at the Centre for Ecology and Hydrology in Lancaster, UK.

That makes assessing biofuel sustainability “daunting” according to Pedro Piris-Cabezas, director for sustainable international transport based in London at the Environmental Defense Fund. “It quickly becomes crazy,” he says. But Piris-Cabezas thinks that tools and methods exist to reliably cut through the complexity, and these will show that some biofuels do reduce carbon emissions without degrading ecosystems and communities. Piris-Cabezas has written a handbook (see go.nature.com/3s6hco2) on tracking methods that can ensure that alternatives to aviation fossil fuels have “high integrity”.

Piris-Cabezas is less confident, however, that such rigorous analysis will show that biofuels can be produced sustainably at large scale. And he is pessimistic

about their economic viability, thanks to an emerging challenge from another class of alternative fuels: electrofuels, produced through renewable electricity and hydrogen. Piris-Cabezas predicts that in the next decade, the cost to avoid a tonne of CO2 emissions through the use of electrofuels will fall to about $70. Cutting a tonne of carbon using current biofuels costs $300–$400, he says, and that cost is likely to rise.

The ultimate dilemma regarding biofuel is intensified competition for finite land. The World Resources Institute, a sustainability think tank in Washington DC, projects a 56% gap between food calories produced in 2010 and those needed in 2050 (see go.nature.com/3tknoy3). At the same time, most mitigation pathways that limit global warming in keeping with the Paris climate agreement require an outright reduction in agricultural land use. Expansion of biofuel production will, therefore, inevitably drive up food prices and worsen food insecurity, says Janet Ranganathan, who studies environmental accounting and technology and oversees research at the World Resources Institute. She doubts that future advances can secure more than a niche role for biofuels: “The prospects for improvement are limited unless the need for dedicated land to grow them is eliminated.”

COVER FOR CARBON

In spite of powerful headwinds, researchers continue working to improve biofuels’ sustainability. “Short of returning land to a completely wild state, we will always be balancing impacts against the needs of society,” says Rowe, whose work is helping the UK government to implement plans to expand the planting of bioenergy crops from close to nothing to about 3% of the UK’s land area by 2050.

And Field's research suggests that biofuels still have the potential to be more than a necessary evil. In a 2020 paper[3] he and his colleagues showed through simulation that, under certain conditions, cellulosic ethanol can rival or exceed the climate benefits of ecosystem restoration. The best results occurred for the case of land use transitioning from food crops or pasture to the cultivation of switchgrass (*Panicum virgatum*), a popular feedstock for cellulosic biofuel. In those cases, Field and his co-authors estimated that the carbon mitigation potential was comparable to that for reforestation. If crop yields and bioprocessing technologies can be improved, and if CO2 from biorefineries can be permanently sequestered deep underground, the researchers predict that supplying cellulosic feedstocks could ultimately store up to four times more carbon than does reforestation. "It's aspirational, but these are areas where there's a lot of research and development attention right now," says Field.

Companies are already developing CO2 pipelines in North Dakota and Illinois, and they're in line for enhanced tax breaks under the US Inflation Reduction Act that was passed in August. Of course, these companies also face significant pushback, including from farmers whose land might be in the pipelines' path.

For the UK bioenergy crop scale-up, Rowe says *Miscanthus* (a crop akin to switchgrass) and other perennial feedstocks are the preferred option. The UK government expects that these crops will help to cut emissions from biorefineries by the 2030s—especially when coupled with deep sequestration. The key, says Rowe, is to use the lessons learnt from biofuels development to work out the most sustainable places to cultivate. That generally means avoiding high-carbon soils such as peatlands, biodiversity hotspots and high-value agricultural croplands.

The best candidates for sustainability are the cover crops in development that seem to be a good response to arguments against dedicating land to biofuels. Soil in fallow fields tends to compact, and is susceptible to erosion by wind and rain. A cover crop puts roots down to secure the soil and its nutrients, and creates channels that help water to sink in rather than drain off. Farmers might be convinced to plant oilseed cover crops because the crop can pay for itself by producing oils that can be supplied to biorefineries.

Nuseed's crop carinata—adapted from *Brassica carinata*, a towering cousin of rapeseed (*Brassica napus*)—produces an energy-rich, inedible oil. And it packs a punch: Johnston says carinata excels at storing carbon in soil and contains about 2.5 times more oil than soya beans, the dominant crop for renewable diesel. Most importantly, he says, carinata does not compete with food supplies or cause climate-harming land-use changes. The latter advantage means that although land-use effects alone add an extra 4–26 grams of CO2 emissions per megajoule of energy delivered from soya-based fuels, according to Field, carinata cuts 9–13 grams of emissions per megajoule from fuels. "Land-use change goes from being a highly uncertain but potentially large liability to having a small-but-positive effect," says Field, who is part of a consortium partnered with Nuseed on carinata research and development.

A 2022 report[4] by Field and his colleagues shows that carinata could support a major biofuels industry in the southeastern United States. Simulating application of carinata every third year across southern Georgia, southern Alabama and northern Florida—a few percent of US cropland—they project annual harvests exceeding 2 million tonnes. That's enough seed to make about one billion litres of aviation fuel.

THE PUSH FOR RIGOROUS RULES

Nuseed started commercial planting in Argentina in 2019 and is sending enough oilseed to the French biofuels producer Saipol this year for the company to generate millions of litres of renewable fuel. Nuseed plans to expand to the southeastern United States by the end of this year and to Brazil by 2024. It intends to scale up fast thereafter, aided by a ten-year supply and market-development deal with energy giant BP, and to be supporting billions of litres of fuel production per year by 2030.

For carinata to occupy a larger role in the biofuels scene smarter policies are needed, says Johnston. Government programmes for biofuels, he says, lack the breadth and specificity to recognize and reward the crop's benefits.

Lilliston concurs, in that refineries selling soya-derived fuels to California pay no penalty for soil carbon depletion caused by industrial farming practices, he says. California and other jurisdictions are planning more sophisticated carbon accounting, but not fast enough for oilseed cover crop developers.

What's racing forwards instead are poorly regulated markets for offsetting carbon—financial instruments that threaten to give regenerative agriculture a bad name. Offsets pegged to soil carbon, created by brokers as well as some agricultural giants, pay farmers to adopt carbon-friendly practices. Corporations purchase most of the offsets to claim progress towards emission reduction pledges such as 'net-zero by 2050'.

These offset markets, however, often ignore the pitfalls associated with carbon accounting, and lack the rigour required for accurate soil carbon measurement. Many offset markets stipulate that soil sampling needs to go to a depth of only 30 centimetres, despite research showing that reliable accounting requires sampling across a crop's full root zone, which could extend down to one metre or more. Some markets also allow contracts requiring farmers to maintain

climate-positive practices for as little as five years, after which it might not be clear whether carbon stores have risen or fallen, let alone by how much.

One big concern is that the benefits of soil carbon offsets, including those associated with cover crop biofuel feedstocks, could turn out to be illusory and thereby undermine the integrity of net-zero targets. These offsets could also encourage lobbying for weaker government rules as regulators catch up. "People buying up cheap soil carbon offsets with questionable accounting methodologies have a vested interest in making sure that tomorrow's regulations don't dissolve their offsets' value," says Ranganathan.

Indeed, these markets might also help to perpetuate the extractive culture that dominates agriculture today. Farmers depend on agribusiness giants and fossil-fuel providers for products such as fuel, fertilizer and seed, and they struggle to make ends meet because those big firms capture most of agriculture's economic value. The balance could tilt even further if farmers are also relying on those corporations' offset programmes to recoup the value of regenerative crop production.

Advocates for farming communities are instead calling for a complete overhaul of the agricultural ecosystem that gives more back to these communities—a system that, as Lilliston puts it, "circulates both natural and economic resources to create a more sustainable and resilient system".

But a ground-up revamp for agriculture is a big ask. If the sustainability of biofuels depends on such fundamental changes, one has to wonder whether another next-generation biofuels failure isn't the more likely outcome.

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content.

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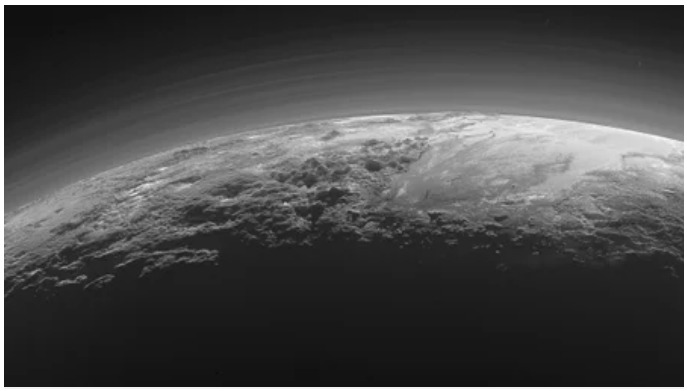

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New Analysis: The 3 Pillars Will Support Large Hydrogen Deployment

New study finds that clean hydrogen deployment under the 3 pillars is *nearly identical* compared to loose rules, while avoiding huge amounts of carbon pollution.

June 20, 2023

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Rachel Fakhry <http://nrdc.org/bio/rachel-fakhry>
Policy Director, Emerging Technologies, Climate & Energy

A new study <https://www.evolved.energy/post/45v-three-pillars-impact-analysis> by Evolved Energy Research casts compelling insight into the heated debate around the IRA 45V clean hydrogen tax credits. **The study finds that the three pillars of 1) new clean supply, 2) hourly matching and 3) deliverability will support substantial deployment of clean hydrogen in this decade.** The study also concludes that all three pillars are the *minimum guardrails* against large carbon emissions increases from hydrogen production and derailing U.S. climate progress. The study – which can be added to the pile of evidence in favor of the three pillars—further crumbles unsubstantiated claims by proponents of looser rules that the three pillars will hobble industry growth. *Those unsubstantiated claims are, yet again, proven to be resoundingly FALSE*.

The study comes against the backdrop of an increasing U.S. and global pipeline of announced three-pillar compliant projects and evidence from the European Union that their adoption of the three-pillars did not shrink the project pipeline. It also comes concurrently with the American Clean Power association (ACP)—the foremost U.S. clean energy trade group—taking a weak position <https://www.eenews.net/articles/renewable-group-shifts-position-shakes-up-hydrogen-debate/> on 45V implementation, endorsing an excessively long transition period before hourly matching kicks in. **The position would lock-in hundreds of millions of tons of carbon emissions through the 2040s.** ACP fell for the myth – sponsored by a few companies hungry for billions of dollars of taxpayer money, carbon emissions be damned—that loosening one or more of the pillars is necessary to support industry growth. *FALSE*. Interestingly, several ACP members do not support <https://urldefense.com/v3/__https:/twitter.com/michael_terrell/status/1669436361328447489__;!!no21cq!fjsx2pkcncn7vhqpovnfj7_j42yec5xre4eqno1d1sobuosnch4j-qxcxdrbwzeng84dbubtvzbhq2p-upwz$> this position.

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The evidence is definitive: in upcoming Treasury guidance, Treasury, DOE, and the White House must require that *all electrolytic hydrogen projects* meet the three pillars to claim the highly lucrative top 45V credit of $3/kg. Looser requirements – including annual matching and arbitrary exemptions from new clean supply requirements -- will result in a grim U-TURN for the power sector, in the form of emissions increases. This would be completely unacceptable, in the very decade when the power sector must rapidly decarbonize to keep U.S. climate goals within reach. It would also bruise the credibility of the nascent clean hydrogen industry and amplify public opposition to hydrogen deployment. To quote a partner of ours: weak rules are a "monster gamble" on the U.S. power grid and the clean hydrogen industry's credibility. But this gamble is completely unnecessary.

The Evolved study was supported by NRDC, but as the study authors note, all conclusions are their independent assessments. **It is not just another study.** Other analyses have either zoomed in on individual project financials, focused on the power sector, or relied on simplified user-selected assumptions. In contrast, the Evolved study examines economywide impacts linked to hydrogen production and can finally offer the coveted answer to the question: **will the three pillars hinder industry growth and jeopardize U.S. goals to scale up a clean hydrogen market? *The answer is a resounding NO***. The study concludes that:

1. The three pillars will support more than 8 million tonnes (MMT) of electrolytic hydrogen production by 2030. This tracks DOE's ambitious 2030 clean hydrogen production target of 10 MMT (a *combined* electrolytic and blue hydrogen target). Further, **electrolyzer deployment is *very similar* by 2030 under both three pillar rules and loose rules**—a result that shatters claims that the three pillars will slow down deployment.
2. The three pillars are necessary to prevent and minimize carbon emissions increases that will undermine U.S. climate goals, kick President Biden's goal of a 100% clean power sector by 2035 further out of sight and compromise the industry's credibility. The three pillars help avoid a cumulative **250 to 650 MMT of carbon emissions** between 2024 and 2032. This is an enormous amount of carbon, with the upper bound equivalent to **more than 40 percent of annual U.S. power sector emissions.**
3. The three pillars will set the industry up for long-term success by incentivizing the right type of investments and behavior for hydrogen projects: flexible electrolyzers capable of operating in harmony with the variability of renewable energy. Evolved asserts that if the clean hydrogen market does not behave in this manner *"it will not have nearly as large a role in a decarbonized energy system as we have projected in previous net-zero analyses."*

Let's dig in.

Brief analysis description.

Using their EnergyPATHWAYS and RIO models, Evolved examined the rate of clean hydrogen deployment and its impact on U.S. energy sector emissions across two implementation frameworks of the 45V credits:

- A "No credit" case which assumes that the 45V credit does not exist. This serves as a baseline case against which to compare results.
- A "Limited requirements" case which assumes that the 45V credits are in place and that Treasury guidelines impose loose eligibility rules on electrolytic hydrogen projects, including the ability to be powered by existing clean energy sources (i.e., no new clean supply requirements) and annual matching. Some companies (here and here <https://static1.squarespace.com/static/53ab1feee4b0bef0179a1563/t/6452ad18d54ae3543c305f15/1683139864709/fchea+additionality+sign+on+letter+final+2023-5-4.pdf>) are heavily lobbying for such lax rules; and
- A "three pillars" case which assumes that the 45V credits are in place and that Treasury guidelines require all electrolytic hydrogen projects to meet the three pillars of new clean supply, hourly matching, and deliverability.

For each of those scenarios, Evolved examined two hydrogen demand cases:

- A restricted demand case, where hydrogen use is explicitly limited mainly to applications where it's already used (in the form of status quo dirty "grey" hydrogen) —notably, oil refining and chemicals manufacturing. Many argue that the bulk of clean hydrogen production in this decade will likely go to those existing uses, given existing hydrogen infrastructure and familiarity with the fuel. And
- An economic demand case, where the hard limit on hydrogen demand is lifted, and hydrogen can be deployed wherever the model finds it economic relative to other energy options. In addition to the uses in the restricted demand case, clean hydrogen is deployed in a wide range of new applications, including synthetic fuels production for marine shipping and aviation, as well as blending in gas turbines for power generation. While the economic demand case is unlikely to materialize in this decade as it does not account for real world constraints likely to slow down uptake in those applications, it serves as a useful test case to examine the technical potential of clean hydrogen deployment and potential impacts if the market accelerates further than we anticipate. Markets move faster than we expect when incentives are in place: the explosive growth of wind and solar over the past 13 or so years offers a useful precedent.

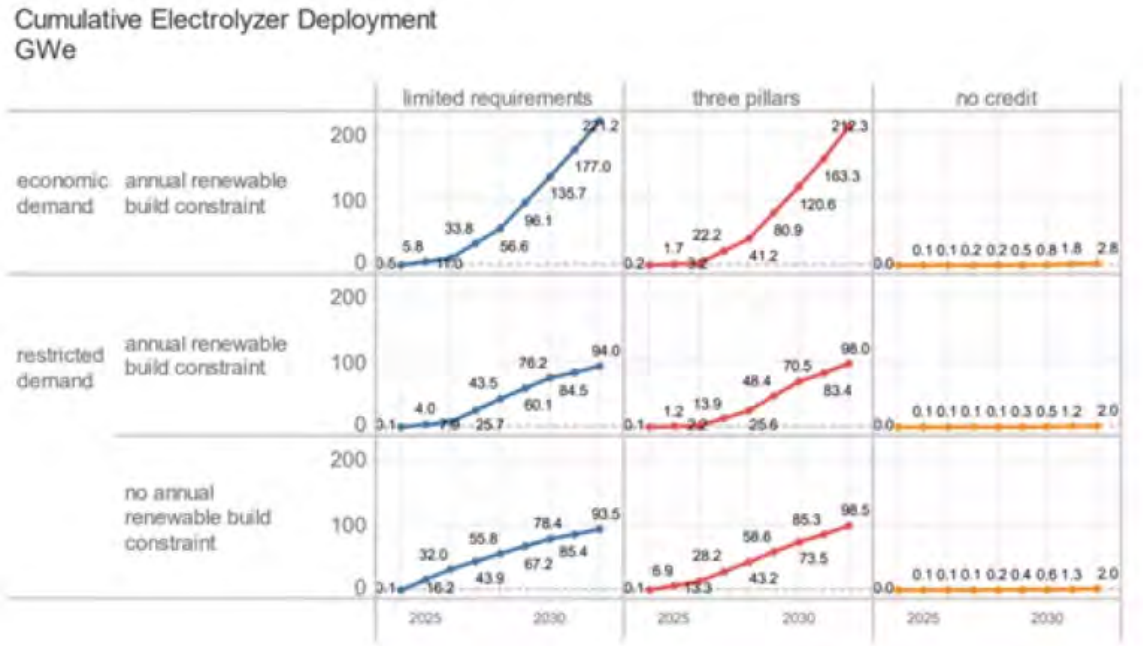
Across most cases, Evolved assumes an annual limit on renewable energy deployment to account for real world constraints like siting, permitting and supply chains. Evolved relaxed the constraint for a few cases to examine impacts on hydrogen deployment and emissions.

The three pillars will support substantial clean hydrogen deployment, delivering on the IRA's intent.

Across all cases, the three pillars have limited impact on clean hydrogen production and electrolyzer deployment**. By 2030, clean hydrogen production subject to the three pillars is more than 8 MMT.** This is substantial. It nearly engulfs DOE's ambitious 2030 clean hydrogen production target of 10 MMT, meant to be spread out between both "blue" hydrogen and electrolytic (or "green") hydrogen and delivered by a suite of supportive policies, not just the IRA.

Notably, electrolyzer deployment under loose requirements and three pillars is *very similar and substantial (see figure below).* Cumulative three-pillar compliant electrolyzer deployment ranges between 70 and 120 gigawatts (GW) by 2030, and 83 and 163 GW by 2032 (the upper limit reflects the economic demand case). In comparison, the International Energy Agency estimates <https://iea.blob.core.windows.net/assets/c5bc75b1-9e4d-460d-9056-6e8e626a11c4/globalhydrogenreview2022.pdf> that electrolyzer capacity *worldwide* currently in the

pipeline amounts to approximately 130 GW by 2030 (though this pipeline is projected to rapidly grow). The sheer scale of deployment demonstrates the generousness of IRA subsidies for both clean hydrogen and renewable energy.



Cumulative Electrolyzer Deployment (GW). Limited requirements reflect loose rules -- i.e., no new clean supply requirement (i.e., no additionality) and annual matching. | *Evolved Energy Research*

Evolved draws a similar conclusion to other studies: hourly-matched projects can achieve the levels of utilization necessary for projects to pencil out– on average more than 60%—by oversizing wind and solar capacity powering the projects. Therefore, U.S. regions with both wind and solar resources are well positioned to be first movers. Interestingly, Evolved finds that the geographic patterns of hydrogen production are fairly similar under the three pillars and loose rules, **demonstrating that the three pillars will not unduly restrict the geographic opportunities for hydrogen production relative to looser rules.**

Evolved finds that while the three pillars will have an impact on the cost of clean hydrogen production, it will not hinder its cost-competitiveness relative to status quo "grey" hydrogen or large-scale deployment. Evolved then argues that since the cost impact of the three pillars will not hobble deployment, it becomes *"a question of the expected returns for investors for hydrogen production and not whether IRA will be successful in driving electrolyzed hydrogen adoption."* **Indeed, the role of taxpayer-funded, public subsidies should be to support sufficient deployment of electrolyzers to drive technology cost reductions and enable a flourishing, unsubsidized market.** It's not about wasting public funds to maximize shareholder value for a few companies.

The results definitively undermine claims by proponents of weak rules – including annual matching and arbitrary exceptions for hydrogen projects from new clean supply rules—that the three pillars will hinder deployment and put on ice needed technology cost reductions. The very similar electrolyzer deployment under both cases is even more stark considering that Evolved made two assumptions that should make it harder for the economics of hourly-matched projects to pencil out: conservative electrolyzer costs that are higher than DOE projections and existing market quotes, and a prohibition on hourly-matched projects to generate additional revenue by selling excess renewable electricity generated by their oversized renewable energy projects (for a deeper dive into this piece, refer to the excellent studies by our colleagues at Energy Innovation <https://energyinnovation.org/publication/smart-design-of-45v-hydrogen-production-tax-credit-will-reduce-emissions-and-grow-the-industry/> and Princeton University's ZERO Lab <https://zenodo.org/record/7838874>).

The three pillars are necessary to prevent significant emissions increases and a grim U-TURN for the power sector and economy.

Emissions outcomes are substantially better under the three pillars relative to loose rules. **Annual emissions through 2032 under loose rules are consistently far higher than under the three pillars,** and the three pillars help avoid a cumulative 250 to 650 MMT of carbon emissions between 2024 and 2032. **This is a huge amount of carbon, with the upper bound equivalent to more than 40 percent of annual U.S. power sector emissions.**

Emissions increases are linked to increased coal and gas electricity generation to support hydrogen production. In particular, annual matching enables unchecked latitude for electrolyzers to balance their operations by drawing power from the grid whenever it suits them, regardless of how dirty the grid is, while procuring annual renewable energy credits (RECs) to qualify for the credit. But procuring annual RECs is ineffective at driving new renewable energy in sufficient volumes to counterbalance emissions increases.

In contrast, hourly matched projects must vary their operations with the availability of renewable energy and have far less opportunities to balance operations by drawing from dirty grids. Instead, they must look to cleaner ways, like oversizing their clean energy supply and/or investing in hydrogen storage. As we discuss below, those are precisely the sort of investments that we need if hydrogen is to support economywide decarbonization.

Annual limits on renewable energy buildout have important bearing on the results. Evolved finds that even the three pillars may not guarantee a positive emissions outcome if we don't accelerate the buildout of renewable energy, *although any emissions increases linked to the three pillars remain substantially less pronounced than those under loose requirements.* The

hydrogen PTC is so lucrative that hydrogen projects are likely to be first in line to procure new renewable energy projects, eating into renewable energy deployment that would have occurred to serve other demand. Under a constrained renewable energy buildout, this drives an increase in fossil fuel generation. **When renewable energy build constraints are relaxed, the three pillars almost entirely prevent an increase in fossil fuel generation and result in emissions *decreases* for the U.S. energy system relative to the baseline, owing to *truly* clean hydrogen replacing fossil fuels in various applications. This is precisely the outcome that the IRA intended.**

In sum, we extract a dual conclusion:

- 1) The three pillars are necessary guardrails to minimize and prevent emissions increases in this decade and beyond and critical to prevent the torpedoing of U.S. climate goals., and
- 2) It is urgent that we lift barriers to renewable energy deployment, both for the sake of economywide decarbonization and to ensure truly clean hydrogen deployment.

The three pillars will set the industry up for long-term success by incentivizing the "right" type of investments.

One of hydrogen's most attractive value propositions is its potential to serve as a beneficial link between various sectors of the economy. As our power sector becomes more reliant on variable renewable electricity, we anticipate increased occurrences of excess wind and solar electricity. Electrolyzers can operate flexibly and utilize this excess renewable electricity to produce and store hydrogen. This helps reduce electricity system costs, because it's a better use of assets, while serving targeted hydrogen end-uses cost-effectively.

But this picture will **not** materialize if annual matching is adopted (in line with ACP's position for example). Because annual matching allows hydrogen projects to balance their operations by drawing power from the grid with near full impunity, there is no need to ramp operations with the availability of renewable electricity or invest in hydrogen storage. To quote an industry partner, annual matching will lead to "dumb technology". In contrast, hourly matching incentives the right and needed behavior and investments – flexible electrolyzers that work in harmony with renewable electricity availability and supported by hydrogen storage.

Evolved argues that "encouraging this type of learning is as important to the development of hydrogen markets as is simply buying down the cost of electrolyzers". In other words, annual matching is akin to spending a ton of cash on excessively fertilizing the soil only to harvest

the wrong crop. Evolved also asserts that if hydrogen projects do not adopt flexible operations *"[the hydrogen market] will not have nearly as large a role in a decarbonized energy system as we have projected in previous net-zero analyses."*

Bottom line: a three-pillar compliant clean hydrogen market will be robust and prevent climate harm.

The three pillars will support substantial growth of the clean hydrogen industry, ensure that it's *actually* "clean", and set it up to play a meaningful role in the U.S. transition to a clean economy. 1) Failing to require the three pillars, 2) allowing for lengthy transition periods before requiring them and/or 3) grandfathering in weak rules before the pillars kick in (a la ACP), would be an exercise in benefiting a few companies or business models, not an exercise in sound policymaking in service of the public.

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THE REPORT APPENDICES

JUNE 2021

TRANSPORTATION

PLUMMETING COSTS AND DRAMATIC IMPROVEMENTS IN BATTERIES CAN ACCELERATE OUR CLEAN TRANSPORTATION FUTURE

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This report is a technical appendix to the 2035 Report 2.0. The main 2035 Report 2.0 can be found here, with supporting documents available at 2035report.com.

The authors thank Moya Melody, Technical Writer/Editor, for her support on this report.

APPENDIX 1

CONTRIBUTIONS OF THIS STUDY TO THE LITERATURE

The 2035 transport report performs a deeper analysis of many of the issues identified in the studies described below.

Most of the studies reviewed here do not assume that all sales of light-duty vehicles (LDVs) can be electric by 2030 and of medium-duty vehicles (MDVs) and heavy-duty trucks (HDTs) by 2035 despite recent evolving indications that the above goals can be reached at both state and national levels. Most of the studies also assume high costs for the needed technologies; assumptions that appear to be outdated given the rapidly dropping prices for electric vehicles (EVs), lithium-ion batteries, and charging infrastructure. Assuming high costs for the technologies leads to overly conservative estimates of benefits (see for example the Princeton University and the Resources for the Future studies). None of the studies described below evaluate the clean power and charging infrastructure required to provide a 90% clean grid by 2035 combined with all vehicle sales being electric by 2030/35. Yet both those goals must be achieved to follow the only trajectory consistent with an emissions reduction scenario that limits global warming to 1.5ºC.

As this literature review shows, the 2035 report is unique in combining expansive techno-economic modeling of 100% electrification of LDVs and HDVs by 2030 and 2035 with a full suite of policy recommendations to achieve that goal and maximize its economic and environmental benefits.

LITERATURE REVIEW

This section highlights a few noteworthy studies that illustrate the approaches various national labs, universities, non-profits, and consulting firms have taken to forecast and analyze deployment of electric vehicles (EVs) at the national, international, and state levels.

Some common themes emerge from the literature we examined.

- Most studies present conservative projections of deployment of electric LDVs by 2030.
- Electrification of HDTs has not been analyzed in depth—current studies forecast reaching a 100% target sometime between 2040 and 2050.

- The reports described below identify market trends that we use as a basis for our analysis. Costs of EV cars, lithium-ion batteries, and charging infrastructure continue to follow a positive learning curve, with prices dropping rapidly as goods and materials are produced at scale.

NATIONAL STUDIES

We found the following national studies to be of interest for our analysis.

Brattle Group (2020)

Getting to 20 Million EVs by 2030: Opportunities for the Electricity Industry in Preparing for an EV Future

This presentation by the Brattle Group assesses what investments in the power sector are needed to facilitate the deployment of what they predict to be 20 million EVs by 2030. They focus on charging infrastructure. Given that 20 million EVs will add about 60-95 TWh of annual electric demand and 10-20 GW of peak load to the national system, they find that $75 billion to $125 billion is needed to enable the electric power sector to meet EV energy demand. Those investments will be needed throughout the supply chain—$30 billion to $50 billion for generation and storage, $15 to $125 billion for transmission and distribution upgrades, and $30 to $50 billion for EV chargers and customer-side infrastructure. The report also finds that total fuel savings of $12 billion/year relative to internal combustion engine (ICE) vehicles translates to an estimated societal payback of 8.6 years to recover the costs of investments in the electricity sector. This number declines to 7.2 years when adding the benefits of reducing greenhouse gas (GHG) emissions. Finally, the report notes that installation of public EV chargers must increase by 40% annually to reach the 1-2 million public chargers needed by 2030. Their methodology for obtaining their 10-35 million EVs aggregates several projections, including some by the Electric Power Research Institute, Boston Consulting Group, Bloomberg New Energy Finance (BNEF), Edison Electric Institute (EEI), Wood Mac, and Annual Energy Outlook (AEO).

Center for American Progress (2020)

Electric Vehicles Should Be a Win for American Workers: How Federal Policies To Expand Electric Vehicle Production Can Ensure a Good Jobs Future for the United States

This paper showcases the ways in which the EV industry can revitalize America's manufacturing sector, arguing that U.S. investment in EVs is lagging, threatening the country's ability to reach its climate goals and

reducing the competitiveness of its domestic auto industry. The authors recommend that policymakers adopt a consistent definition of what constitutes a good clean energy job, including standards to provide that all associated workers earn fair wages and high-quality benefits, can access such jobs no matter who they are or where they come from, and have a fair shot at joining a union. To make those protections real, the authors say that policymakers should attach the labor standards to government investments in boosting consumer demand for EVs, spur manufacturers to invest in domestic manufacture of EVs and critical EV components, such as batteries, and build a nationwide network of electric charging stations.

Consumer Reports (2020)

Electric Vehicle Ownership Costs: Today's Electric Vehicles Offer Big Savings for Consumers

Using current data on EV depreciation rates, maintenance and repair costs, and average vehicle prices, this study assesses the costs of EV ownership and savings compared to owning an ICE car. They find that, when adjusted for federal purchase incentives, EV values are expected to depreciate at the same rate as ICE vehicles in the same class during the first five years of ownership. Drivers, however, save 50% in repair and maintenance costs when averaged over a typical vehicle lifetime. EVs overall were estimated to save consumers about 60% on fuel costs compared with the average ICE vehicle in the same class. For all EV models analyzed, the lifetime ownership costs were between $6,000 and $10,000 lower than for all comparable ICE vehicles.

Department of Energy (2019)

Summary Report on EVs at Scale and the U.S. Electric Power System

This report was prepared by the Grid Integration Tech Team and Integrated Systems Analysis Tech Team of the U.S. DRIVE partnership. The authors examine a range of EV market penetration scenarios (low, medium, and high), along with associated changes to energy generation and capacity of the U.S. electric power system. The paper's summary conclusion is that, based on historical growth rates, sufficient energy generation and generation capacity will be available to support a growing EV fleet, even if EV market growth is high. The report's analysis utilized scenarios involving low, medium, and high market projections developed by EPRI: EV sales in 2030 at 320 thousand (2%), 2.2 million (12%), or 6.8 million (40%) of new vehicle sales. Those scenarios result in EVs representing 3 million (1%), 14 million (5%), or 40 million (15%) of the passenger vehicle fleet by 2030. The incremental generation capacity needed annually to support EV charging demand under the high scenario was projected to have a peak of 15 GW from 2035 to

2039. The medium scenario peak of 8.5 GW occurs from 2045 to 2049. The high scenario involves exceeding the historical average annual expansion in dispatchable capacity of 12 GW observed during the past decade.

Environmental Defense Fund (2021)

Clean Cars, Clean Air, Consumer Savings: 100% New Zero Emissions Vehicle Sales by 2035 **Will Deliver Extensive Economic, Health and Environmental Benefits to all Americans**

This report identifies the pathways to providing that all passenger vehicles sold are zero emission by 2035 and new medium and heavy-duty trucks are zero emission by 2040. The report has three key findings. By 2030, the buyer of a new EV will save $7,200 during the life of the car compared to an ICE vehicle. A new 2030 EV also will deliver $8,000 in societal benefits as a result of reduced particulate pollution and climate damage, effects that increase the total net benefits to more than $15,000 per vehicle. Those results are estimated to reduce GHG emissions by 600 million metric tons in 2040, roughly the annual climate emissions from Canada, and cumulatively eliminate more than 11.5 billion tons by 2050.

M.J. Bradley & Associates (2021)

Electric Vehicle Market Status–Update: Manufacturer Commitments to Future Electric Mobility in the U.S. and Worldwide

This paper describes the current status and projected growth of the U.S. electric vehicle industry and its products, including light-, medium-, and heavy-duty vehicles. The report finds that carmakers worldwide will spend more than $257 billion through 2030 to produce new electric models, investing more than $22 billion to open new or renovated plants in the United States. Those expected new and renovated plants will employ 24,000 people directly, adding to the almost 130,000 people the EV industry employs throughout the United States. The report provides other important information, including projections of EV market penetration between 2021 and 2023. The authors estimate that the number of electric vehicle models available to U.S. consumers will increase from 60 to 76 and will include SUVs and pick-up trucks. The report also projects that by 2030 the cost of electric car batteries will be as low as $61 per kilowatt-hour (kWh).

National Renewable Energy Laboratory (2018)

Electrification Futures Study: Scenarios of Electric Technology Adoption and Power Consumption for the United States

This analysis presents scenarios for adoption of electric end-use technologies in the contiguous U.S. energy system through 2050. The end uses considered for electrification include all on-road transport, most of the buildings sector, and parts of the industrial sector. The study scenarios indicate that the transport sector experiences the greatest transition toward electrification. Stock penetration of plug-in electric vehicles in the 2050 light-duty fleet is estimated to be about 11% in the base-case scenario and nearly 84% in the high scenario. The pervasive penetration in the high scenario is designed to include some plug-in electric vehicle sales beyond those assumed in many studies. This analysis estimates that by 2050 more than 240 million light-duty electric cars and trucks, 7 million medium- and heavy-duty electric trucks, and 80,000 electric transit buses will travel on U.S. roads. The study also finds that although electrification of vehicles potentially will increase demand for electricity, the rates of growth in compound annual electricity consumption, even under the high scenario, are less than long-term historical growth rates.

Princeton University (2020)

Net-Zero America: **Potential Pathways, Infrastructure, and Impacts**

The Net-Zero America study describes a pathway for state and national action to meet the 2050 net-zero emissions target. The study argues that energy demand for transportation ultimately must be one-third to one-half of 2020 levels, an achievement requiring reductions in energy use for every mode of transport except aviation. The authors demonstrate that LDV energy use must decrease the most: given aggressive electrification, 17% of LDVs on the road will be electric by 2030 and 96% by 2040. With less aggressive electrification, the 2030 and 2050 shares are 6% and 61%, respectively. Their model assumes that electric LDVs will reach cost parity with ICE cars around 2030. In their scenario the fleet of HDVs makes achieves cost parity by 2050 because their 2030 costs will be relatively high compared to costs for LDVs. The study uses the Energy PATHWAYS model to construct scenarios, one specifying 5-year time steps for the electrification of transportation (as well as of buildings and water heating), and the other reflecting slower electrification. They use a detailed optimization model, RIO, to calculate the lowest-cost mix of supply-side and network infrastructure to meet demand targets and reach net zero by 2050.

Resources for the Future (2020)

Progress and Potential for Electric Vehicles to Reduce Carbon Emissions

This report forecasts EV deployment in 2025 and beyond. The authors conclude that even as more EV models enter the market in the next few years, EVs will continue to have only a modest effect on transportation sector emissions, because most ICE vehicles on the road today will remain on the road in 2025. To accelerate the transition, the paper recommends continuing federal and state EV tax credits, removing the credit sales cap on manufacturers, establishing zero-emissions mandates at the state or federal level, and developing strong federal CAFE and GHG standards for passenger cars. The paper estimates that before 2030 overall costs of ownership for EVs likely will fall below the costs for ICE cars for all but the largest vehicles. They also predict that cars having a 250-mile range will be available by 2027. The report uses EPRI forecasts of EV sales to develop an optimistic scenario that estimates that 65% of cars sold will be EVs by 2035. The authors caveat those results, however, by noting that aggressive policies are required to overcome barriers to widespread deployment of EVs.

Rocky Mountain Institute (2019)

Breakthrough Batteries: Powering the Era of Clean Electrification

This report describes current battery technologies, their potential

applications, and projections for their future uses. The authors state that advances in technology and manufacturing will keep Li-ion batteries at the forefront of electrochemical energy storage through 2025. The report claims that emerging innovations will improve all aspects of Li-ion battery performance and costs likely will decline to about $87/kWh by 2025. In addition, low-cost Li-ion batteries will contribute to a rapid scale-up of personal and commercial EVs in the U.S. market after 2025. Rocky Mountain Institute (RMI) predicts that as early as 2025, and no later than 2030, non-Li-ion battery technologies will make significant progress in commercialization of long-duration energy storage, electrification of heavy transport, and battery-integrated approaches to fast-charging infrastructure. To harness this rapid development of batteries, however, RMI recommends that utilities and regulators assess the potential for decreasing battery prices to minimize investment in stranded assets.

Rocky Mountain Institute (2020)

Reducing EV Charging Infrastructure Costs

This paper provides a cost analysis of EV charging infrastructure by analyzing industry data, current levelized costs of charging infrastructure, publicly available information on utility procurements, and interviews with representatives of industry, utilities, software firms, transit agencies, and consultancies. RMI uses their core findings to draw comparisons to the trajectory of the solar sector during the past decade: As with solar components, the costs of EV hardware components, when manufactured at scale, decline along a learning curve as manufacturers find ways to squeeze cost out of their processes. Because costs for software systems are a relatively small part of total infrastructure cost, they do not offer a significant cost-reduction opportunity. RMI found that the greatest opportunities for cost reduction are in soft costs such as those for processes, marketing, opportunity, delays, and permitting.

STATE STUDIES

Below we describe two reports on states' progress toward electrifying the transport sector.

American Council for an Energy-Efficient Economy (February 2021)

ACEEE State Transportation Electrification Scorecard

This report evaluates the progress states have made in electrifying their transportation sectors. The scorecard evaluates states' planning and goal setting related to EV adoption, creation of charging infrastructure,

incentives for EV deployment, efficiency of transport systems, optimization of the electric grid, enacting of EV equity, and outcomes of transport electrification. California leads the United States in adopting EVs, having set deadlines for electrification of transit buses, heavy-duty trucks, and commercial vehicles as well as having adopted statewide building codes for EV charging. The other states in the top 10 are New York, Washington, D.C., Maryland, Massachusetts, Vermont, Colorado, Oregon, Washington, and New Jersey. California and New York are identified as among the few states developing programs for providing equitable access to electrified transport for low-income communities. All states, even early adopters of transport electrification, have room to improve in expanding EV sales and installing charging infrastructure.

Resources for the Future (2019)

California's Evolving Zero-Emissions Vehicle Program: Pulling New Technology into the Market

This paper analyzes California's Zero Emission Vehicle (ZEV) program, a key state policy for reducing GHG from the state's transport sector. The program reduces the cost for industry's overall compliance. The report concludes that ultimately the program succeeds because it has spurred innovation and has proved a major driver for vehicle electrification both in the United States and worldwide. The paper suggests that the program can remain viable by continuing the market for vehicle credits as well as including price transparency and a backstop price for credits sold to manufacturers. The program's continued success depends on decreases in the cost of batteries, expanding EV infrastructure, and suggested changes to the credit market. This paper was published before California announced its target of 100% EV sales by 2035.

INTERNATIONAL STUDIES

We include one international report, which evaluates China's success with deploying large numbers of EVs.

International Council on Clean Transportation (2021)

Driving a Green Future: A Retrospective Review of China's Electric Vehicle Development and Outlook for the Future

This report outlines how China, during the past decade, has created the world's largest market for electric vehicles. China today accounts for half of the world's electric cars and more than 90% of electric buses and trucks. China now is entering a new era as if faces both increasingly fierce global competition and the nation's new pledge to achieve carbon neutrality by 2060. The report concludes that China's success was built

on 1) a clear strategy for the EV industry; 2) top-down planning that set clear development targets and policies to achieve those targets; 3) aligned industry, energy, and environmental goals; 4) multi-stakeholder partnerships among government, industry, academia, and research programs to form strategies and roadmaps; 5) fiscal and regulatory policies to help launch and grow the market; and 6) innovation at the level of local governments.

THE 2035 TRANSPORTATION REPORT

The 2035 Report 2.0 outlines ways to develop a clean electric grid, identifying the investments and policies needed to boost renewable base load. The report also offers ambitious market forecasting for EVs and analyzes the consumer benefits of electrification of LDVs, MDVs, and HDTs and ownership of passenger EVs. The benefits include overall consumer savings, savings in total cost of individual ownership, and improvement in health and the environment.

The 2035 Report 2.0 presents a socio-economic analysis that identifies links between 100% EV sales and revitalization of the U.S. manufacturing industry. The analysis also describes the social benefits of reducing transport pollution and greenhouse gas emissions, specifically discussing the ways in which frontline and minority communities will benefit.

As the above literature review illustrates, this report is unique in combining expansive techno-economic modeling of 100% electrification of LDVs and MDVs and HDTs by 2030 and 2035, respectively, with a full suite of policy recommendations to achieve those goals and reap their benefits.

APPENDIX 2

METHODS, DATA, AND SCENARIOS

This appendix describes the core methods, data, scenarios, and results that underlie the 2035 Report 2.0, which focuses on the decarbonization of the transportation sector. As our methods borrow extensively from the 2035 Report 1.0, whose methodology can be found here, this appendix focuses on modeling and analytical methods specific to the transportation sector.

METHODS AND DATA

Our study analyzes the effects of two policy scenarios on electrification of the transportation sector. A baseline scenario, termed the No New Policy scenario, assumes the continuation of existing (2020) state and federal policies and assumes the extant barriers to EV adoption persist. The second scenario, termed the Drive Rapid Innovation in Vehicle Electrification (DRIVE Clean), describes the requirements and benefits of achieving 100% electric vehicle sales by 2035.

Eight discrete analyses underpin the findings reported here and in the 2035 Report 2.0.

- Total cost of ownership (TCO)
- Stock turnover
- Fleet-level cost
- Grid modeling
- LDV charging infrastructure
- MDV and HDT charging infrastructure
- Health and environmental effects
- Jobs impacts

Figure 1 shows the interactions and dependencies among the eight analyses. The TCO and stock turnover models are independent of each other, but jointly inform the analysis of fleet-level consumer and environmental savings. All other analyses, including estimated needs for charging infrastructure, environmental benefits, and grid and jobs impacts are based on the fleet dynamics estimated in the stock turnover

model and on external inputs. The methodology, data inputs, and assumptions underlying each of the eight analyses are described in the following sections.

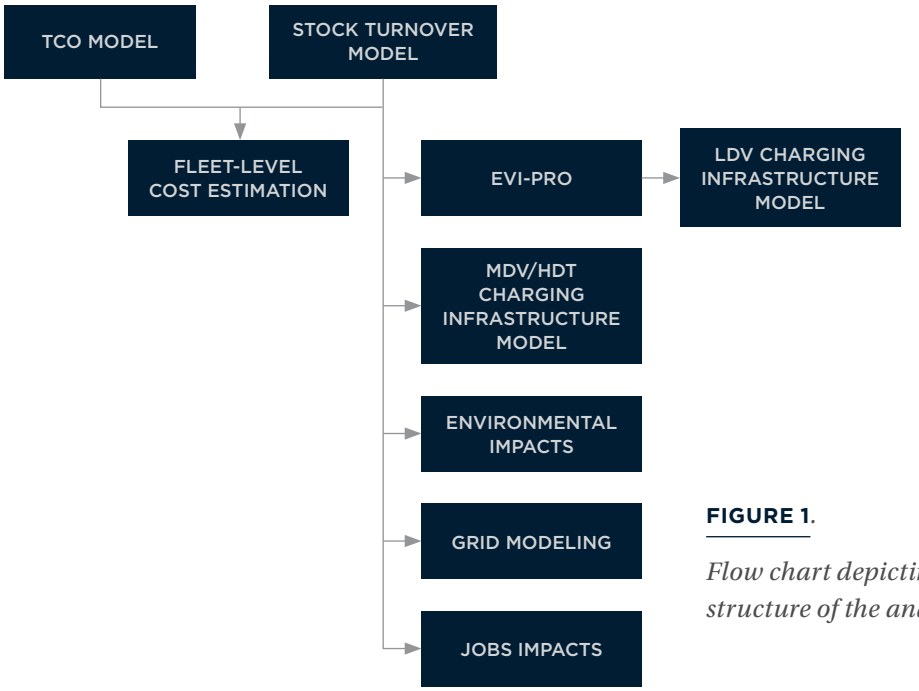


FIGURE 1.

Flow chart depicting the structure of the analysis

Total Cost of Ownership

A combination of operational, economic, and technical input assumptions and data inform the TCO model, as shown in **Figure 2**. The outputs of the TCO model are the lifetime-averaged TCO on a per-vehicle and per-mile basis by vehicle class for both ICE vehicles and EVs sold between 2020 and 2050.

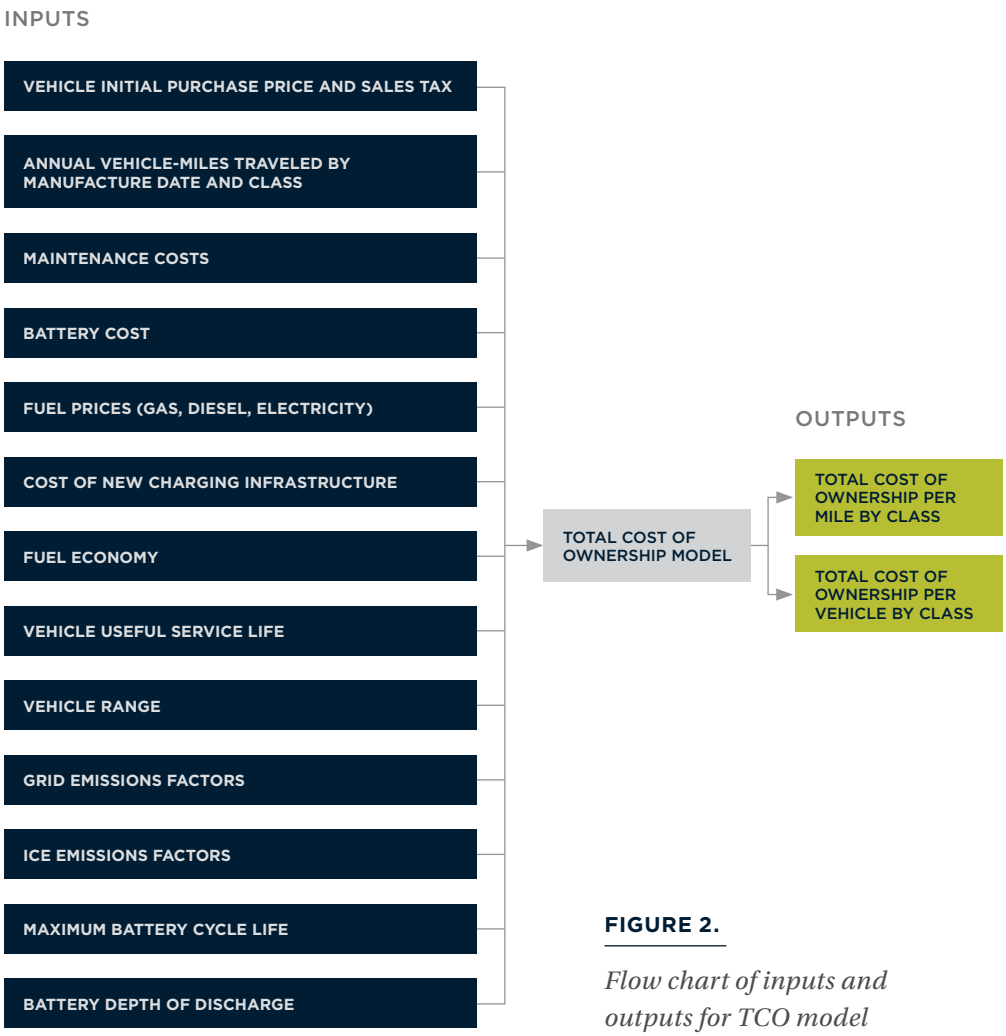


FIGURE 2.

Flow chart of inputs and outputs for TCO model

We establish six vehicle classes based on gross vehicle weight rating (GVWR) as defined by the Federal Highway Administration (DOE 2021): class 1, class 2a, class 2b-3, class 4-5, class 6-7, and class 7-8 tractors. **Table 1** presents the characteristics of the six classes by GVWR, fuel used (for ICE vehicles), the aggregate classification of the vehicles, and example vehicles. For both ICE and electric vehicles, the TCO is the total cost of purchasing, operating, and maintaining the vehicle divided by the total miles driven during the vehicle's useful lifetime. Operational specifications such as vehicle miles traveled (VMT) per year over the vehicle's useful service life were derived from California's 2017 EMission FACtors (EMFAC) data [California Air Resources Board (CARB) 2017]; Environmental Protection Agency (EPA) rulemaking analyses (Federal Register 2002); and industry reports. Annual VMT by vehicle class and age are shown in **Figure 3**. Average useful lifetimes of vehicles range from 9 to 15 years. Note that the inputs to the TCO calculation rely only on exogenous economic and technical data and are agnostic to any policy scenario.

TABLE 1.

Descriptions of vehicle classes

CLASS	GVWR (LB)	AGGREGATED CATEGORY	ICE FUEL USED*	EXAMPLE VEHICLE
Class 1	0 - 6,000	LDV	100% gasoline	Sedan
Class 2a	6,001 - 8,500		100% gasoline	SUV
Class 2b-3	8,501 - 14,000		50% gasoline 50% diesel	Heavy-duty pickup
Class 4-5	14,001 - 19,500	MDV	100% diesel	Box truck Large walk-in truck City delivery truck
Class 6-7	19,501 - 33,000		100% diesel	School bus Refuse truck City transit bus
Class 7-8	26,001 - 33,001 +	HDT	100% diesel	Tractor-trailer

** We assume national average ethanol blending (10%) per the U.S. Energy Information's (EIA's) Annual Energy Outlook 2021.*

† Although class 6–7 and class 7–8 tractors overlap in GVWR, the latter specifically denotes vehicles designed for pulling trailers.

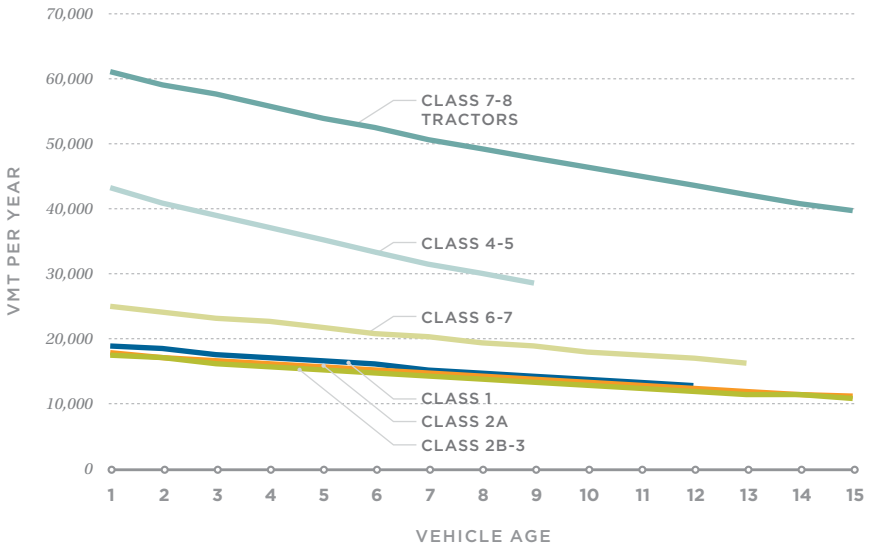


FIGURE 3.

Vehicle miles traveled by vehicle class over vehicle lifetime[1]

1 The endpoint of the VMT trends correspond with the assumed average useful life for that vehicle class.

The TCO comprises eight elements: sales tax and upfront cost,[2] fuel (electricity for EVs, gas or diesel for ICE vehicles), maintenance, battery replacement during the EV's lifetime,[3] and the cost of building charging infrastructure nationwide. The final two elements apply only to EVs. Additionally, we include the environmental cost of CO_2 equivalent emissions and air pollution, which corresponds to direct tailpipe emissions for ICE vehicles and grid-related emissions for EVs. We discuss assumptions and data inputs for each of these TCO components in further detail in the following sections.

Upfront Vehicle Costs

Sales tax is assumed to be 8% of vehicle purchase price, in line with CARB 2019. We source ICE upfront costs from the CARB 2019 analysis except for classes 1, 2a, and 7-8 tractor, which we determine through bottom-up modeling. Given that the technology and manufacturing are well established for ICE vehicles, we assume their upfront costs remain constant throughout the study period. For EVs, the upfront costs of all vehicle classes are determined through bottom-up modeling based on Lutsey and Nichols 2019 and Bauer et al. 2021. Results of the bottom-up modeling, which accounts for battery costs, electric drivetrains, vehicle assembly, and indirect costs, are then harmonized with the sales prices of current or proposed EV models. **Figures 4a-c** illustrate assumptions regarding upfront costs for ICE vehicles and EVs in the six classes listed in Table 1.

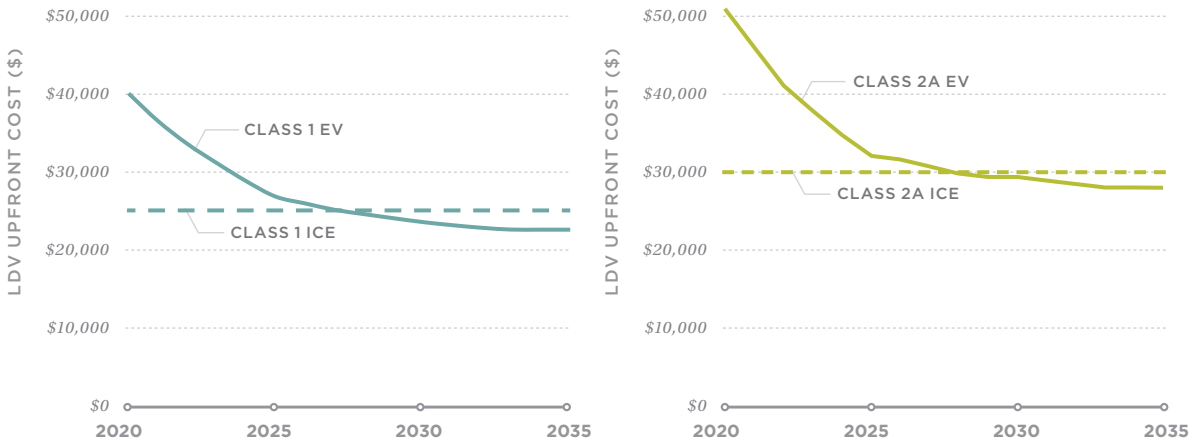


FIGURE 4A.

Upfront cost by vehicle technology for LDV classes

2 Referred to jointly as upfront cost.

3 Battery replacement cost is included in maintenance costs in the TCOs for EVs.

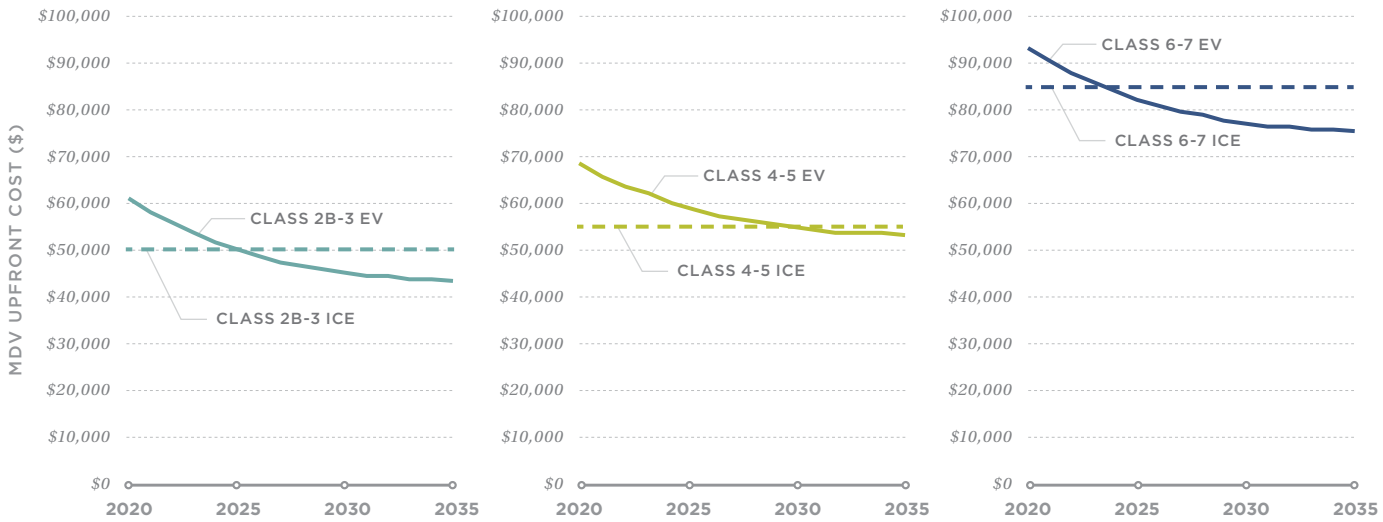


FIGURE 4B.

Upfront cost by vehicle technology for MDV classes

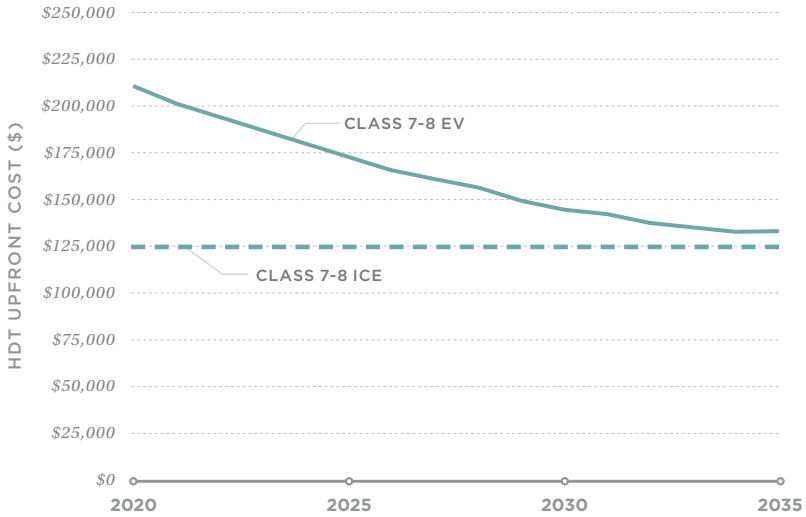


FIGURE 4C.

Upfront cost by vehicle technology for HDTs

Maintenance Costs

We derive vehicle maintenance costs on a per-mile basis for all ICE and EV medium- and heavy-duty vehicle classes from CARB 2019. Maintenance costs for ICE and EV LDVs are borrowed from Lutsey and Nicholas 2019.

Fuel Costs

The key assumptions for estimating fuel costs are fuel efficiency and fuel price. Electricity is the sole fuel source for all EV classes. We specify electricity rates by aggregate vehicle class. We assume that LDVs access

a residential rate starting at $0.13/kWh, MDVs a commercial rate starting at $0.11/kWh, and HDTs an industrial rate of $0.08/kWh. Electricity rates increase slowly throughout the study period, in line with electricity prices in the 2035 Report. Among ICE vehicles, LDVs are assumed to operate on gasoline that has a 10% ethanol content. We assume that MDVs and HDTs are fully diesel-powered, with the exception of class 2b, which is 50% diesel and 50% gasoline (again blended with 10% ethanol). As we did with EVs, we project gasoline and diesel prices based on Annual Energy Outlook (AEO) 2020. Diesel prices begin at $2.5/gallon in 2020, increasing to $3.3/gallon by 2030. Similarly, gasoline prices are assigned a $2.3/gallon price in 2020 and $2.8/gallon in 2030**. Figures 5 and 6** show the price trends for fossil fuels and electricity during the study period.

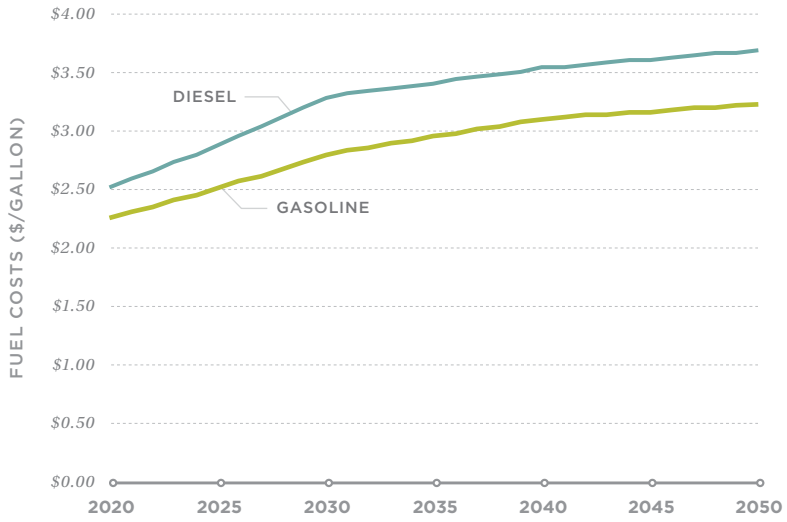


FIGURE 5.

Fossil fuel prices

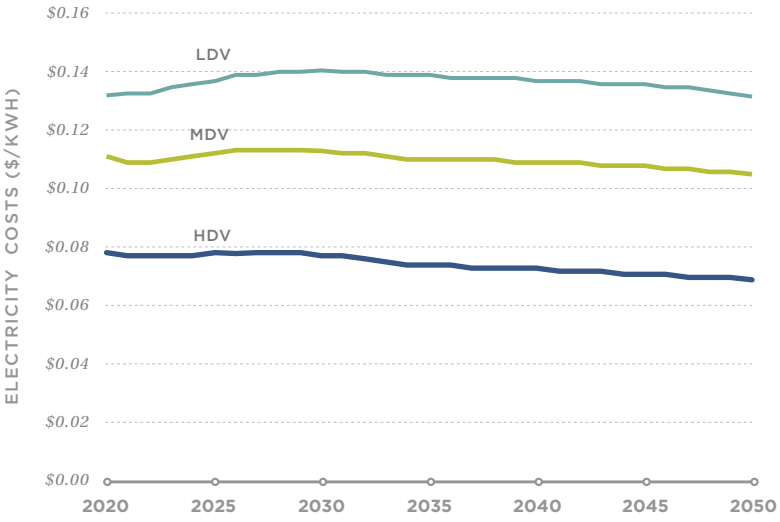


FIGURE 6.

Electricity prices

We obtain fuel efficiencies for ICE vehicles from CARB 2019, but apply correction factors ranging from 0.7 to 0.95 to harmonize those estimates with projections developed by the U.S. Energy Information Administration[4] and the National Renewable Energy Laboratory (NREL 2018). Fuel economies for ICE LDVs begin in the range of 27 to 30 mpg in 2020 and increase to 30 to 35 mpg by 2030. In 2020 fuel efficiency of MDVs range from 6.6 to 7.5 mpg, increasing to 6.8 to 8.1 mpg by 2030. Finally, in 2020 HDTs get 6.1 mpg, increasing to 6.3 mpg in 2030.[5] Fuel efficiencies for electric LDVs and MDVs are sourced from Murphy et al. 2021; HDT fuel efficiencies are in line with a recent LBNL study (Phadke et al. 2021). For EVs, 2020 LDV efficiencies range from 3.1 to 3.5 miles per kilowatt-hour (mi/kWh), increasing to 3.4 to 4.0 mi/kWh by 2030. In 2020 MDV efficiencies range from 0.5 to 1.8 mi/kWh in 2020, increasing marginally to 0.5 to 1.9 mi/kWh by 2030. Electric HDTs are assumed to have an efficiency of 0.4 mi/kWh throughout the study period. **Table 2** presents details of our assumptions about fuel efficiency.

TABLE 2.

Summary of vehicle fuel efficiency assumptions by class 2020-2050

		FUEL EFFICIENCIES BY VEHICLE CLASS (MPG, MI/KWH)			
VEHICLE CLASS	TECHNOLOGY	2020	2030	2040	2050
Class 1	ICE	29.7	34.5	40.2	45.1
	EV	3.5	4.1	4.7	5.3
Class 2a	ICE	26.7	29.1	31.5	33.7
	EV	3.1	3.4	3.7	4.0
Class 2b-3	ICE	7.5	8.1	8.1	8.1
	EV	1.8	1.9	1.9	1.9
Class 4-5	ICE	9.5	9.9	9.9	9.9
	EV	0.5	0.5	0.5	0.5
Class 6-7	ICE	6.6	6.8	6.8	6.8
	EV	0.5	0.5	0.5	0.5
Class 7-8 (tractor)	ICE	6.1	6.3	6.3	6.3
	EV	0.4	0.4	0.4	0.4

4 2021. EIA website. 2021. Open Data. https://www.eia.gov/opendata/qb.php?category=711246&sdid=TOTAL.TRFRRUS.A [accessed 05/21/2021]

5 A range of values represents variation among classes within an aggregate weight class (LDV, MDV, or HDT). For example, fuel efficiency of MDVs range from a lower bound of 6.6 mpg for the lightest MDV class (class 2b) to an upper bound of 7.5 mpg for the heaviest MDV class (class 6-7). Class 4-5 lies in the middle of the range.

Costs of Battery Replacement and Charging Infrastructure

The TCO components of battery replacement and charging infrastructure apply exclusively to EVs. To calculate the cost of battery replacements required over a vehicle's useful lifetime, we assume a maximum battery life of 10 years or 1,500 cycles at an 80% depth of discharge—whichever comes first. The cost of a replacement battery is determined by the capacity of the battery, which depends on the modeled range of the vehicle class, multiplied by the per-kWh cost of the battery in the year of replacement. Small adjustments are made to account for the battery's packing fraction and overcapacity factors. The average cost of charging infrastructure for LDVs, which includes both home and public charging infrastructure, is estimated to be 0.71 ¢/mi between 2020 and 2035, falling to 0.57 ¢/mi from 2036 onward. These estimates, which are based on a bottom-up calculation of the infrastructure needed to support electrification under the DRIVE Clean scenario, are calculated using NREL's EVI Pro tool. Charging infrastructure for HDTs is mostly highway charging at already established highway truck stops. The average cost of HDT charging infrastructure is estimated to be 1.94 ¢/mi between 2020 and 2035, dropping to 1.46 ¢/mi from 2036 onward. Those figures again are based on a bottom-up estimate of the charging infrastructure needed under the DRIVE Clean scenario. For MDVs, most of the charging infrastructure will be located at existing parking lots and warehouses. The average cost of charging infrastructure for MDVs is estimated to be 50 ¢/mile until 2035, decreasing to 47 ¢/mile from 2036 onward.

Stock Turnover

We use a bespoke vehicle stock turnover model to examine the dynamics of the national vehicle fleet under the two policy scenarios we analyze. As **Figure 7** shows, the stock turnover model uses the starting 2020 vehicle population, EV sales targets, and historical sales data as inputs, then estimates the number of ICE vehicles and EVs sold and retired each year between 2020 and 2050.

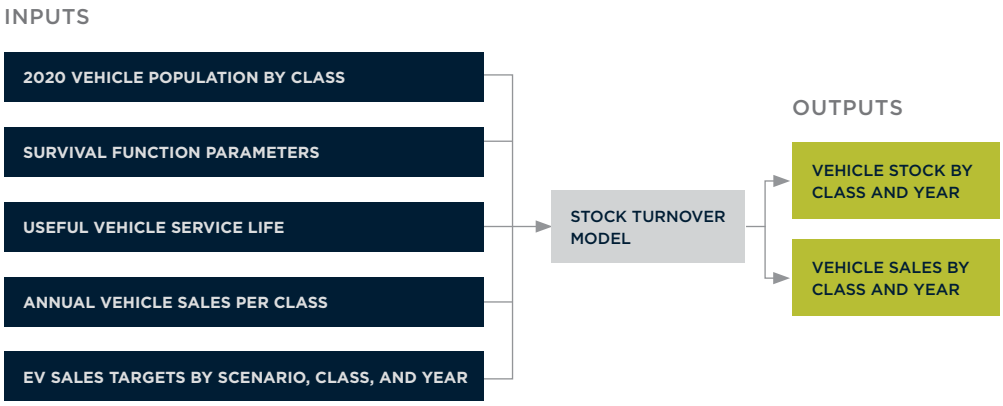


FIGURE 7.

Flow chart of inputs and outputs for stock turnover model

We estimate the number of new vehicles sold per year using historical sales data from the Federal Reserve Bank of St. Louis (FRED 2021).[6] **Table 3** shows our assumptions for starting vehicle populations and sales in 2020. The 2020 vehicle populations are triangulated from several sources, including the EMFAC 2017 database,[7] Federal Highway Administration (FHWA) 2020,-the U.S. Census Bureau 2004, and EPA 2015.

TABLE 3.

Vehicle populations and sales by class in 2020

AGGREGATE VEHICLE CLASS	POPULATION IN 2020	NATIONAL SALES IN 2020
Class 1	115,114,000	7,441,000
Class 2a	116,590,000	6,772,000
Class 2b-3	8,586,000	484,100
Class 4-5	953,600	90,800
Class 6-7	1,128,000	80,300
Class 7-8 tractors	3,244,000	205,000

Annual sales are allocated between ICE vehicles and EVs based on the EV sales target for each year. That target scales logarithmically from 2020 levels as estimated by Bloomberg New Energy Finance (BNEF) 2019, to reach 100% of sales in the scenario target year. The No New Policy scenario assumes that EV sales follow BNEF 2019 projections.

We calculate the probability of a vehicle retiring at the end of its useful life using a Weibull distribution function (survival function) applied at the class level. The methodology and parameters for the survival functions are informed by International Council on Clean Transportation (ICCT) modeling (ICCT 2012) but use the characteristic service lives defined in **Table 7**. **Figures 8-10** show the survival functions for the aggregated categories, where the x-axis represents the age of the vehicle and the y-axis represents the probability that the vehicle is still in operation.

6 Although our sales trends reflect FRED data, the magnitude of sales differ given that we use more disaggregated vehicle categorizations than does FRED.

7 California Air Resources Board online database. https://arb.ca.gov/emfac/2017/ [last accessed 05/21/02021]

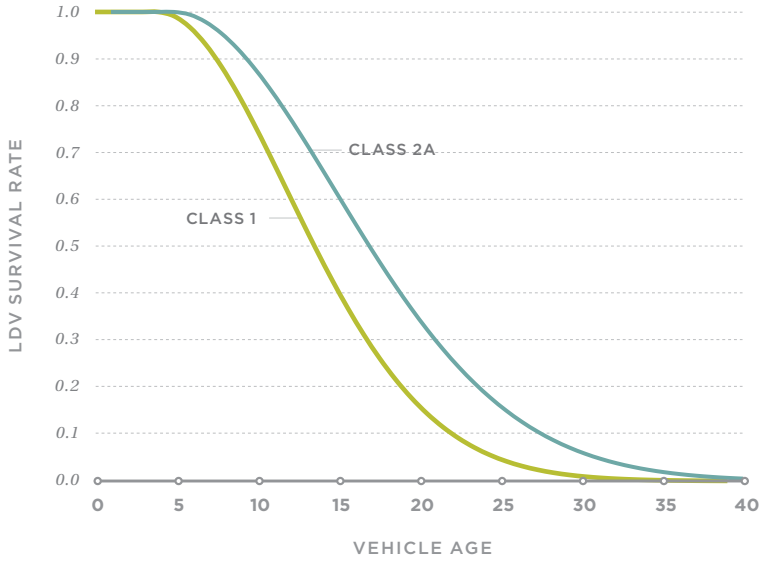


FIGURE 8.

LDV survival rates

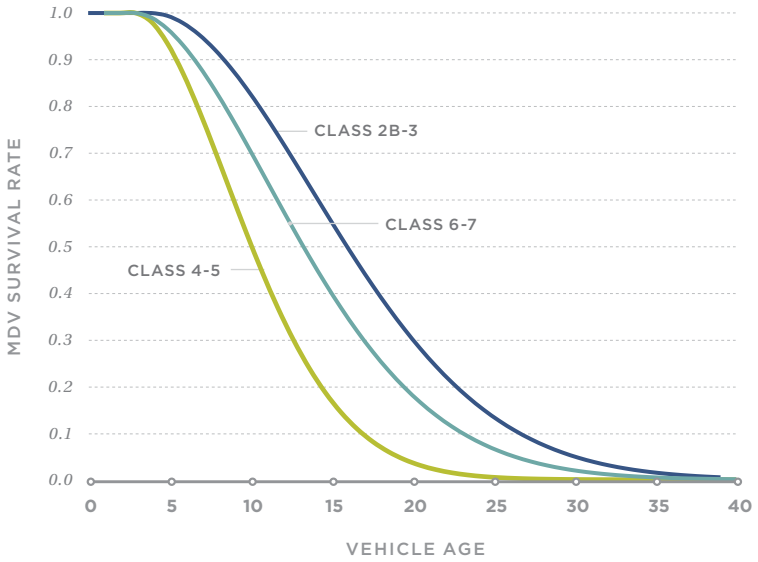


FIGURE 9.

MDV survival rates

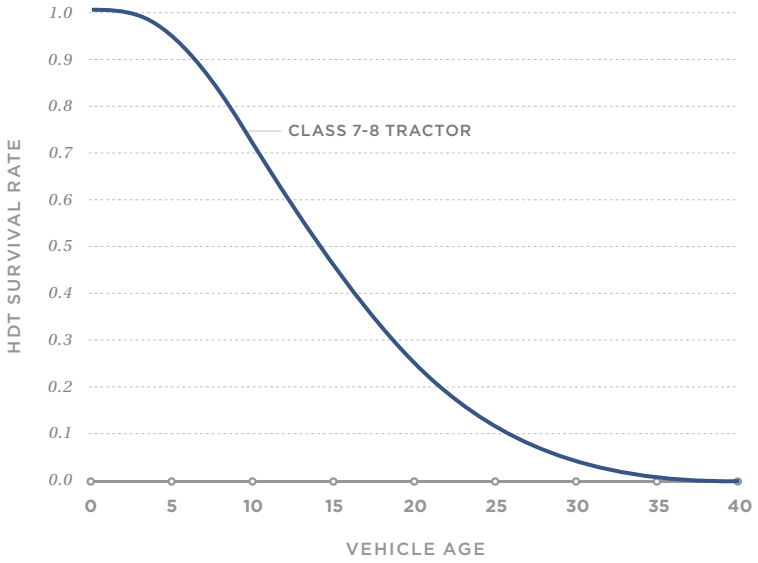


FIGURE 10.

HDT survival rate

The survival functions enable us to estimate the number of both electric and ICE vehicles retired each year. Combined with the projections of vehicles sales, for each policy scenario the stock turnover model produces estimates of ICE, EV, and total vehicles retired and sold each year nationwide between 2020 and 2050 by class.

Fleet-Level Cost Estimation

Costs at the fleet level are estimated by combining the vehicle-level TCO estimates, the populations of both ICE vehicles and EVs as estimated by the vehicle stock turnover model, and annual VMT, as shown in **Figure 11**.

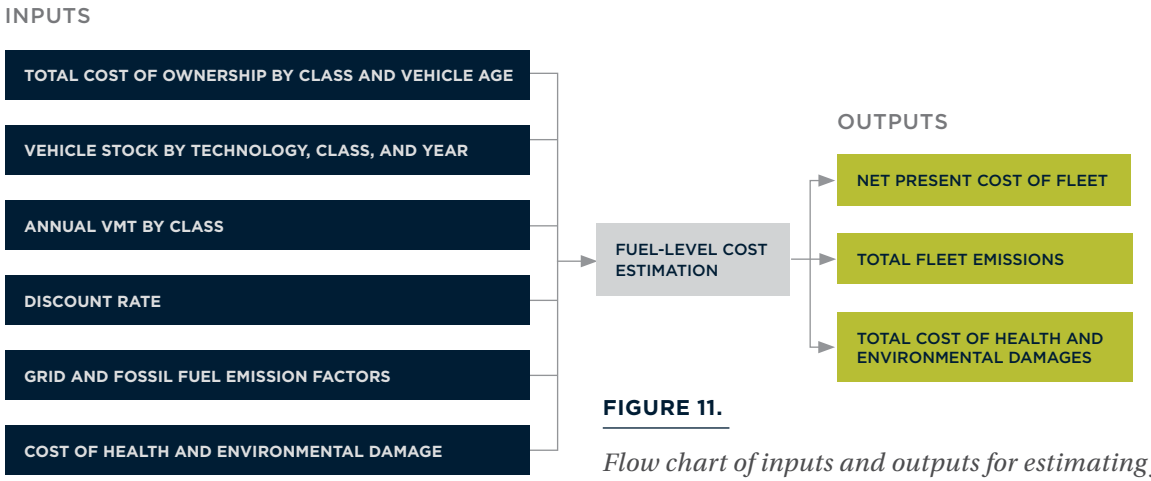


FIGURE 11.

Flow chart of inputs and outputs for estimating fleet-level costs

For each scenario, we estimate the total cost per year for each component of the TCO: upfront costs, fuel expenditures, and maintenance costs. The sum of those elements is the total fleet-wide cost. This total cost enables us to compare the effects of fleet electrification under the DRIVE Clean scenario on consumer costs, along with health and environmental effects, compared to the No New Policy baseline.

Grid Modeling

Assessing the effects of extensive penetration of renewable energy on electric power systems relies on state-of-the-art capacity-expansion models, production cost models, or a combination of the two. For this study we use a combination of a capacity-expansion model, the Regional Energy Deployment System (ReEDS) from Brown et al. 2020, and the industry-standard production cost model PLEXOS, employed by grid operators and utilities worldwide (Energy Exemplar).

Capacity Expansion

Capacity-expansion models identify the optimal resource mix to meet future peak and annual energy requirements at the lowest cost. Large-scale regional or national models such as the National Energy Modeling System, Integrated Planning Model, and ReEDS typically are used to evaluate federal policies and forecast how those policies will affect electricity generators. Capacity-expansion models can examine generation, transmission, and attempts to co-optimize generation and transmission deployment. Most capacity-expansion models rely on simplified dispatch methodologies and thus do not consider unit commitment or hourly dispatch and so do not produce outputs regarding detailed plant operation.

ReEDS identifies the least-cost portfolio of power sector assets required for electric generation (by technology and fuel), storage, and transmission required to meet regional electric power demand. The models consider grid reliability (reserve) requirements, technology resource constraints, and policy constraints. The U.S. power system is represented by 134 interconnected zones, which primarily represent key load-balancing areas (**Figure 12**). The 134 zones are connected by 310 transmission lines. ReEDS incorporates all generation and high-voltage transmission assets up to 2018. For future years, it includes planned capacity additions and retires generation assets at the end of their technical lives. ReEDS obtains potential generation from renewable resources (primarily wind and solar) from NREL's Wind Integration National Dataset (WIND) Toolkit[8] and National Solar Radiation Database (NSRDB)[9]. The resources represent 356 resource regions, which are subdivisions of the 134 zones. Those smaller regions provide additional granularity regarding resource variability. The ReEDS documentation provides additional details (Brown et al. 2020).

8 NREL. No date. Wind Integration National Data Set Toolkit. [last accessed 05/21/2021]
9 NREL. No date. National Solar Radiation Database. [last accessed 05/21/2021]

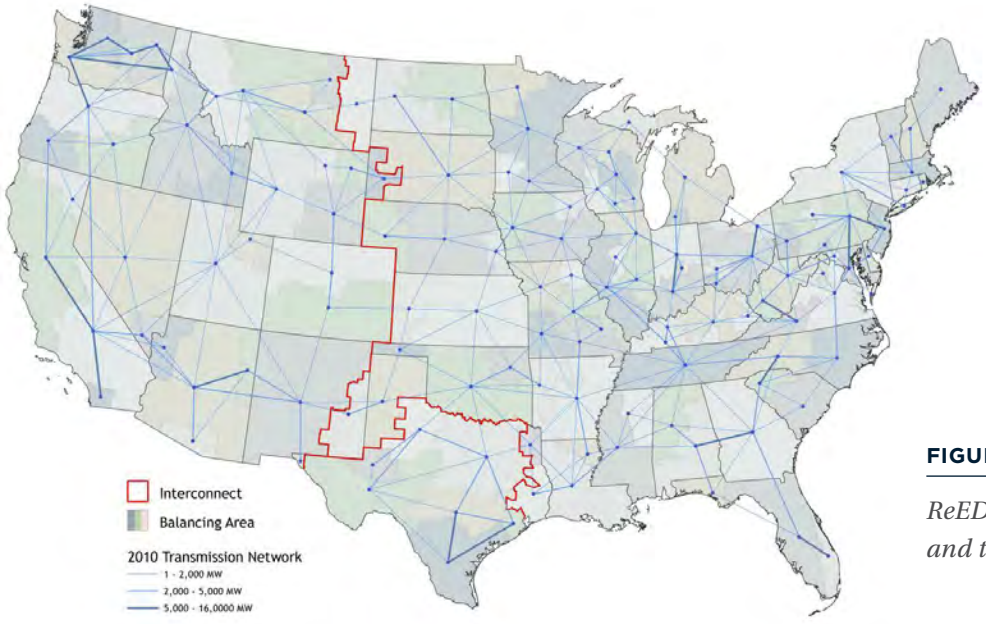


FIGURE 12.

ReEDS load-balancing zones and transmission network

Source: Brown et al. 2020

Grid Dispatch

To assess future operational feasibility, we use the production cost model PLEXOS by Energy Exemplar[10] to simulate the hourly dispatch of generators, storage, and transmission ties for 2035. Production cost models determine how to meet electricity demand at least cost by optimizing unit commitment and hourly dispatch. The optimization considers variable costs and operational constraints for a given power generation mix and transmission capacity.

Based on the EIA's data and operational constraints at the generator level, we use PLEXOS to model more than 15,000 generators within the 134 ReEDS zones. After correlating the map of ReEDS regions to PLEXOS, we apply the transmission line limits from ReEDS to the 310 transmission lines/connections modeled in PLEXOS. We then add to the PLEXOS model the generation and transmission expansion and retirement outputs from ReEDS, including renewable energy generators. We simulate hourly grid dispatch and operations in 2035 based on seven weather years (2007 to 2013), more than 60,000 hours in all, using time-synchronized hourly wind, solar, and load data at the regional level.

To get hourly profiles of solar and wind generation, we use the supply-curve approach, using data from NREL. NREL's WIND Toolkit gives hourly profiles of wind generation for 126,000 candidate sites nationally,

10 Energy Exemplar. https://energyexemplar.com/ [last accessed 05/22/2021]

selected using certain key criteria such as resource quality, proximity to the existing transmission and load centers, and land exclusion constraints, such as bodies of water, protected lands, and urban areas.[11] The total capacity from these 126,000 sites adds up to around 2TW. Within each ReEDS resource region (356 total), we choose the best resource quality sites from the candidate sites until we reach the ReEDS optimized installed capacity in that region. We then add the hourly generation profiles of all chosen sites within each resource region to create resource region level profiles for the given wind portfolio. If a resource region does not have enough sites to meet the capacity requirement from ReEDS, we scale up the capacity from all the candidate sites within the region to match the requirement.

NREL's National Solar Radiation Database gives hourly radiation data (global horizontal, direct normal, and diffuse horizontal irradiance) and meteorological data for each 2km by 2km grid cell within the contiguous U.S.[12] We use NREL's System Advisor Model Software Development Kit (SAM SDK) to convert the hourly radiation and meteorological data into power output.[13] Within each ReEDS zone (134 total), we choose 50 grid cells at random, and spatially average the power output data over the zone. Note that if the ReEDS output changes, the hourly wind generation profiles used in PLEXOS would also change, but not the solar generation profiles.

Estimating the Total Cost of Generation

New Investments

ReEDS output includes capital investment in new generation and transmission assets (starting in 2010, with actuals up to 2018). Based on NREL's Annual Technology Baseline (ATB) 2019,[14] we annualize investment costs by using a weighted average real cost of capital (WACC) of 2.75% (5.25% nominal).

Existing Assets

Because ReEDS does not report the cost of investing in generation capacity built before 2010, we estimate those costs exogenously. First, we use plant-level specifications from EIA Form 860 to assess the undepreciated value of generation assets built before 2010. For conventional technologies, we use the capital cost assumptions in NREL's ATB 2019 shown in **Table 4**, to assess the value of each generation plant during its commissioning year.

11 National Renewable Energy Lab. Wind Toolkit.
12 National Renewable Energy Lab. National Solar Radiation Database.
13 National Renewable Energy Lab. System Advisor Model.
14 NREL. 2019. Annual Technology Baseline (ATB). [last accessed 05/22/2021]

TABLE 4.

Capital cost of key conventional technologies in $/kW ($2018 real)

TECHNOLOGY	$/KW ($2018 REAL)
Hydro (NSD1)	7,277
Coal	4,036
Nuclear	6,742
Gas-CCGT	927
Gas-CT	919
Geothermal (Hyd-binary)	5,918
Biopower	3,990

Source: NREL. ATB 2019

We add $1,000/kW to all coal power plants to reflect the cost of installing the emission control equipment. We then apply straight-line depreciation to estimate the remaining economic value of every generation plant, assuming an economic life of 30 years for all technologies except batteries, which we assign an economic life of 15 years. We use the average utility WACC of 6.2% (real) to annualize these costs of current capacity, then add them to our total costs.

For newer technologies such as wind and solar PV, we use historical capital costs from Wiser et al. 2019 and Bolinger et al. 2019. For example, capital costs for wind energy started at approximately $3,000/kW in the 1990s, decreasing to about $1,400/kW by the late 2000s, with a weighted-average capital cost of $1,600/kW in $2018 real.

Charging Infrastructure

We examine the costs associated with installing charging infrastructure for EVs. Charging infrastructure requirements for LDVs are calculated separately from heavier MDV and HDT classes, and as such are discussed separately in the following sections.

Light-Duty Vehicles

We use a bottom-up charging infrastructure model to estimate the number of chargepoints and the investment necessary to support LDV electrification under the DRIVE Clean scenario (**Figure 13**).

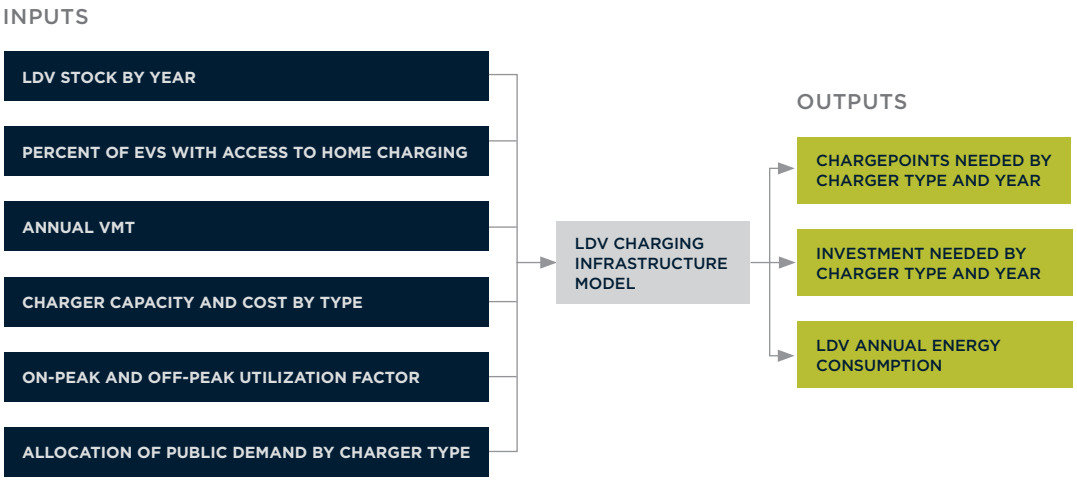


FIGURE 13.

Flow chart of inputs and outputs for model of LDV charging infrastructure

The key input to the model is the maximum electricity demand from vehicle charging per year in each state, which we estimate using NREL's EVI-Pro tool.[15] First we downscale the number of LDVs nationwide to the state level using scalar factors from Murphy et al. 2021. Downscaling is necessary to stay within the maximum vehicle population allowed by EVI-Pro Lite. We then use the EVI-Pro API to calculate the yearly load in 15-minute intervals for each state during the study's 31-year timeframe in six charging categories: home L1, home L2, work L1, work L2, public L2, and public L3. A separate script identifies the maximum demand for each year, now re-aggregated to the national level.

We make several adjustments to the six vehicle charging categories. First, we assume that home L1s will be phased out by 2025 given the increasing availability of inexpensive L2 home chargers. Thus after 2025 the home L1 load is reallocated to the home L2 category. Similarly, we assume that work L1 chargers will phase out, so that beginning in 2020 all work L1 demand is allocated to work L2. We also add a category for 100-kW L3 fast charging. To correct EVI-Pro results, which favor work charging, we combine the maximum demand from all work and public charging, then reallocate it nearly equally among work L2 (25%), public L2 (35%), public 50-kW L3 (25%), and public 100-kW L3 (20%).

Within each charging category, we convert from maximum demand to the number of chargepoints by assuming a factor for coincident use of peak demand and chargepoint capacity. This factor represents the utilization of the charging infrastructure at the moment of peak demand. For example, a coincident use factor of 0.75 would indicate that at the time of peak demand 75% of available chargepoints are in use. Using this number of chargepoints and the estimated cost per chargepoint (including both hardware and installation) from **Table 5**, we estimate the total investment needed for expanding charging infrastructure. Table

15 NREL. Developer Network. EVI-Pro Lite https://developer.nrel.gov/docs/transportation/evi-pro-lite-v1/

5 lists the coincident use factors, capacities, and cost assumptions for each charging category.

TABLE 5.

Coincident use, capacity, and cost per charger type

CHARGER TYPE	PEAK COINCIDENT USE FACTOR	CAPACITY (KW)	COST ($/CHARGEPOINT) (2020-2035)	COST ($/CHARGEPOINT) (2036-2050)
Home L2	0.15	11	1,476	1,179
Work L2	0.90	11	4,500	3,600
Public L2	0.57	11	4,500	3,600
Public L3	0.72	50	28,874	18,983
High-Capacity Public L3	0.75	100	55,409	37,858

To check that our chargepoint estimates are within reason, we use the LDV population from the stock turnover model and vehicle efficiencies to calculate the expected energy consumption per year from the LDV fleet. This estimate is exogenous to the chargepoint calculation. Using the chargepoint estimates and introducing an average utilization factor in 2020 of 17% for home charging and 7% for work and public charging (and scaling slowly over time), we calculate the total annual energy consumed by charging. We compare the results year by year to the expected fleet energy consumption to check that we are not oversizing or undersizing the charging infrastructure needed to support the electric LDV fleet.

Medium-Duty Vehicles and Heavy-Duty Trucks

We assume that the HDT charging infrastructure will be installed at existing highway truck stops. We estimate the overall requirement for charging infrastructure by modeling every current U.S. highway truck stop and optimally siting 125-, 350-, and 1,000-kW chargepoints so as to cover every freight mile a truck might travel. We assume that the MDV charging infrastructure (50-, 125-, and 350-kW chargepoints) will be built at warehouses and parking lots in ways that allow for an MDV to be reliably charged for all miles driven in any given day. MDVs are also assumed to have access to the LDV and HDT charging infrastructure. The MDV and HDT traffic flows and miles traveled are obtained from FHWA data (2020). Estimated cost per chargepoint is shown in **Table 6**.

TABLE 6.

Estimated cost per chargepoint for MDV and HDT

CHARGING TYPE	CAPACITY (KW)	COST (HARDWARE + INSTALLATION) ($/CHARGEPOINT) (2020-2035)	COST (HARDWARE + INSTALLATION) ($/CHARGEPOINT) (2036-2050)
MDV 50	50	28,874	18,983
MDV 125	125	69,261	47,322
MDV 350	350	169,175	103,905
HDT 125	125	69,261	47,322
HDT 350	350	169,175	103,905
HDT 1000	1000	483,358	296,872

Environmental Impacts

We rely on the peer-reviewed literature to estimate the value of the environmental and public health effects of selling only electric vehicles. We use national average mortality factors per vehicle miles traveled from Thakrar et al. 2020 to estimate total premature deaths due to vehicular air pollutant emissions, specifically from primary and secondary particulate matter ($PM_{2.5}$). As efficiencies of ICE vehicles improve between 2020 and 2050, we reduce the mortality factors for each vehicle category in proportion to efficiency increases.

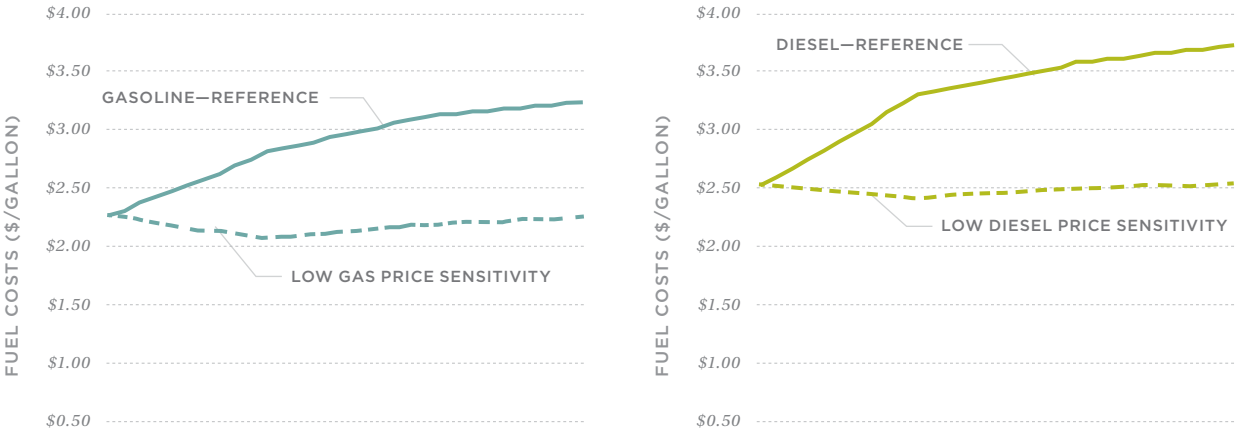
We use the methodology applied in developing the 2035 Report to evaluate health impacts related to the power sector. We estimate the change in yearly sulfur dioxide (SO_2) and nitrogen oxide (NOx) emissions (which contribute to forming secondary $PM_{2.5}$ in the atmosphere) in each of the 134 ReEDS regions. We then apply state-level mortality factors from Thind et al. 2019 to estimate total premature deaths attributable to SO_2 and NO_x emissions in each state. Our estimate of the economic benefits of avoided CO_2 and $PM_{2.5}$ emissions relies on a methodology and values consistent with the 2035 Report. We multiply the value of a statistical life from Holland et al. 2020, $9.6 million (2020 real), with the premature deaths avoided through reductions in primary and secondary $PM_{2.5}$ emissions. The economic benefit of avoided CO_2 emissions is estimated using a social cost of carbon derived from Baker et al. 2019 and Ricke et al. 2018 which in 2020 is $49.6/MT, increasing at 3% per year ($66.1/MT by 2030 and $76.6/MT by 2035). We multiply the social cost of carbon by the net reductions in CO_2 emissions from the transportation and power sectors.

Sensitivity Analyses

We validate the robustness of our TCO analysis and fleet-level cost assumptions using two sensitivity scenarios that are adverse to vehicle electrification:

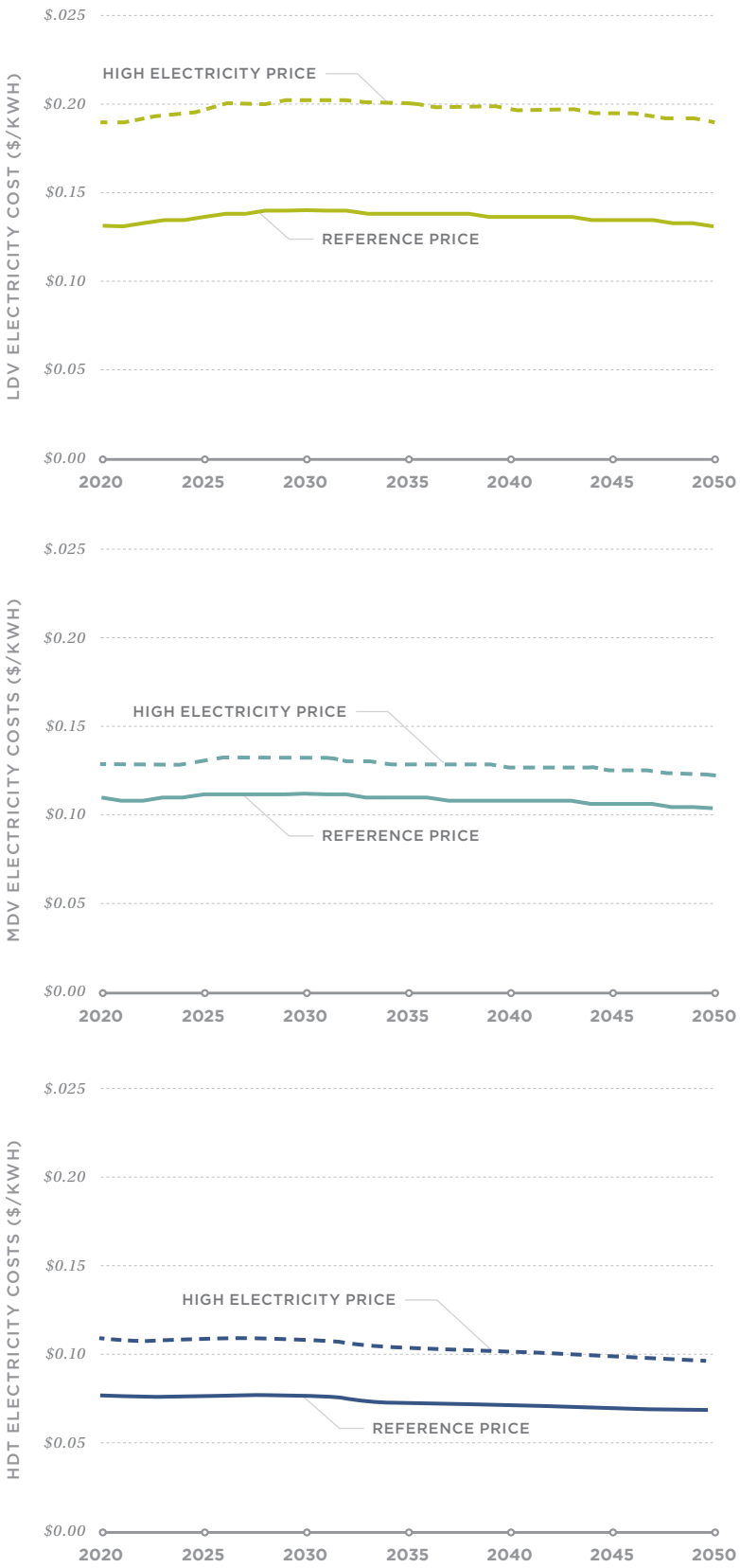
1. Low gas and diesel prices (taken from the AEO 2020s High Oil and Gas Supply case; AEO 2020.)
2. High electricity prices

Figure 14 compares the gas and diesel prices and electricity prices used in the core scenarios compared to the sensitivities. **Figure 15** show the assumed sensitivity of electricity prices for LDVs, MDVs, and HDTs.



FIGURES 14.

Cost assumptions for gasoline and diesel sensitivity prices



FIGURES 15.

LDV, MDV, and HDT electricity sensitivity prices

Data Overview

Table 7 summarizes the key variables and assumptions underlying the data we used for our TCO analysis and estimation of fleet-level costs.

TABLE 7.

Summary of key variables and assumptions

PARAMETERS	ASSUMPTIONS OR VALUES	SOURCE
OPERATIONAL PARAMETERS		
Vehicle populations	Nationwide fleet population by class in 2020. Class 1: 115,000,000 Class 2b: 117,000,000 Class 2b-3: 8,590,000 Class 4-5: 954,000 Class 6-7: 1,130,000 Class 7-8 tractor: 3,240,000	Analysis of CARB's 2017 EMFAC database; EPA MOtor Vehicle Emission Simulator (MOVES) methodology (EPA 2020).
Vehicle useful service lives	Maximum useful service life is 15 years. Class 1: 12 years Class 2a: 15 years Class 2b-3: 15 years Class 4-5: 9 years Class 6-7: 13 years Class 7-8 Tractor: 15 years	Analysis of EMFAC2017 database (CARB 2017).
Vehicle miles traveled	Average VMT by class and age. Figures are for first year after manufacture. VMT declines by 3%-5% per year in all classes throughout their useful service life. Class 1: 18,800 Class 2a: 17,700 Class 2b-3: 17,300 Class 4-5: 43,000 Class 6-7: 24,900 Class 7-8 Tractor: 60,900	EMFAC2017 database (CARB 2017), EPA rulemaking analysis (FR 2002), and industry reports.

PARAMETERS	ASSUMPTIONS OR VALUES	SOURCE
Fuel economy	Assumptions about fuel economies for 2020, 2030, and 2050 in mi/gallon for ICE vehicles and kWh/mi for EVs. For both types, fuel economy for LDVs increases slowly while remaining close to static for MDVs and HDTs. ICE: Class 1: 29.7 | 34.5 | 45.1 Class 2a: 26.7 | 28.9 | 33.7 Class 2b-3: 7.5 | 8.1 | 8.1 Class 4-5: 9.5 | 9.9 | 9.9 Class 6-7: 6.6 | 6.8 | 6.8 Class 7-8 Tractor: 6.1 | 6.3 | 6.3 EVs: Class 1: 3.5 | 4.1 | 5.3 Class 2a: 3.1 | 3.4 | 4.0 Class 2b-3: 1.8| 1.9 | 1.9 Class 4-5: 0.5 | 0.5 | 0.5 Class 6-7: 0.5 | 0.5 | 0.5 Class 7-8 Tractor: 0.4 | 0.4 | 0.4	ICE: CARB 2019 analysis with correction factors ranging from 0.7-0.95 to harmonize estimates with EIA and projections from NREL 2018. EVs: CARB 2019 (for MDVs and HDTs). NREL 2018 for LDVs (CARB 2019).
EV range	250 mi for LDVs/MDVs; 300 mi for HDTs	LDV/MDV range based on most popular vehicles sales and average daily miles traveled; HDT range based on average VMT using FHWA 2020 data.
Battery operational characteristics	Assume a maximum battery service life of 1,500 cycles (at 80% depth of discharge) or 10 years, whichever comes first.	Phadke et al. 2021.
ECONOMIC PARAMETERS		
ICE vehicle: Initial purchase price	Purchase prices remain constant throughout the 2020-2050 timeframe. Class 1: $25,000 Class 2a: $30,000 Class 2b-3: $50,000 Class 4-5: $55,000 Class 6-7: $85,000 Class 7-8 Tractors: $125,00	CARB 2019; market analysis of current LDV models.
EV: Initial purchase price	Purchase prices in 2020, 2030, and 2050. Prices drop steeply between 2020 and 2030 as battery costs decline. Class 1: $40,000 | $23,000 | $23,000 Class 2a: $52,000 | $29,000 | $28,000 Class 2b-3: $61,000 | $45,000 | $43,000 Class 4-5: $71,000 | $55,000 | 53,000 Class 6-7: $93,000 | $77,000 | $75,000 Class 7-8 Tractor: $210,000 | $146,000 | $125,000	Bottom-up cost model.

PARAMETERS	ASSUMPTIONS OR VALUES	SOURCE
Maintenance costs	Costs are in 2020 USD per mile by vehicle class. Values are assumed to remain static. Maintenance costs for EV LDVs are about half of those for ICE LDVs. For MDVs and HDTs, costs for EVs are 25% lower than for ICE vehicles. ICE: Class 1: $0.06 Class 2a: $0.09 Class 2b-3: $0.17 Class 4-5: $0.31 Class 6-7: $0.31 Class 7-8 Tractor: $0.19 EVs: Class 1: $0.03 Class 2a: $0.04 Class 2b-3: $0.13 Class 4-5: $0.23 Class 6-7: $0.23 Class 7-8 Tractor: $0.14	For MDVs and HDTs: CARB 2019. For LDVs: Lutsey and Nichols 2019.
Electricity prices	Assume 2020 residential rates of $0.13/kWh for LDVs; commercial rates of $0.11/kWh for MDVs; and Industrial rates of $0.08/kWh for HDTs. By 2050, rates decrease modestly by 7%-13%. A sensitivity case considers unexpectedly high rates. In the high-price scenario, electricity prices for all classes remain relatively stable at $0.19/kWh (LDV), $0.13/kWh (MDV), and $0.11/kWh (HDT).	EIA Annual Energy Outlook 2020.
Fossil fuel prices	Average national prices for gas and diesel follow EIA projections. Prices below are for 2020, 2030, and 2050 in $/gallon. Gas: $2.26 | $2.80 | $3.23 Diesel: $2.52 | $3.29 | $3.69 The low fuel price sensitivity scenario assumes the following prices for 2020, 2030, and 2050 in $/gallon. Gas: $2.26 | $2.06 | $2.24 Diesel: $2.52 | $2.41 | $2.53	EIA AEO 2020.
Charging infrastructure costs	A per-mile cost for charging infrastructure is applied based on aggregate vehicle weight classes. The values shown below are for 2020-2035 and 2036-2050. LDVs: $0.0071 | $0.0057 MDVs: $0.0050 | $0.0047 HDTs: $0.0194 | $0.0146	Based on required number of chargepoints and estimated hardware and installation costs per chargepoint (authors' estimates).
Tax	8% of purchase price	CARB 2019.
Battery price	Predicted rapid decreases in battery prices drive the analysis. Assume that 2020 battery costs are $121/kWh, which drop to $62/kWh in 2030 and plateaus at $50/kWh after 2031.	BNEF 2019.
Discount rate	We assume a discount rate of 2.75%.	

PARAMETERS	ASSUMPTIONS OR VALUES	SOURCE
ENVIRONMENTAL PARAMETERS		
Grid emissions factors	Assume an average CO_2 emissions factor of 360 g/kWh in 2020, dropping to 160 g/kWh in 2030 and to 30 g/kWh in 2050.	Based on ReEDS results for capacity/generation mix needed for a 90% clean grid by 2035.
Grid environmental damage	Health and environmental damages quantified in ¢/kWh. Includes damages from CO_2, SO_2, and NO_x. Damages lessen over time as the penetration of renewables reaches 90% in 2035. Starting value is 2.1 ¢/kWh in 2020, decreasing to 1.1 ¢/kWh in 2030 and 0.21 ¢/kWh in 2050.	Based on ReEDS results on capacity/generation mix needed for a 90% clean grid by 2035.
Fossil fuel emissions factors	Assume CO_2 emission of E10 gasoline to be 0.008 ton/gallon and of diesel 0.010 ton/gallon. These emissions factors remain constant.	EIA 2016.*
Fossil fuel environmental damage	Environmental damages are considered separately for LDVs and MDVs/HDTs.† Below are costs of environmental damages relating to fossil fuel tailpipe emissions in ¢/mile in 2020, 2030, and 2050. LDVs: 2.7 | 2.3 | 1.8 MDV/HDTs: 19.9 | 19.0 | 19.0	Based on Thakrar et al. 2020 using a statistical value of life of $9M adjusted to account for increasing energy efficiency of ICE vehicles.
Cost of carbon	Assume cost of carbon in $/ton to be $49.2 in 2020, $66.1 in 2030, and $119.4 in 2050.	Ricke et al. 2018; Baker et al. 2019.
CHARGING INFRASTRUCTURE PARAMETERS		
Charger capacity	Assumed capacities in kW by charger type: L1: 1.4 L2: 11.0 DCFC: 50 High-capacity DCFC: 100	Wood et al. 2017.
On-peak utilization	Assume utilization factors at time of peak demand for home, work, public L2, Direct Current Fast Charging (DCFC), and high-capacity DCFC. Factor represents percent of available chargepoints in each category in use at hour of peak demand. Factors scale slowly during the study period, except for home charging, which remains stable. Home L2: 15% Work L2: 90% Public L2: 57% Public DCFC: 72% High-capacity public DCFC: 75%	

** EIA. 2016. Carbon dioxide emissions coefficients. https://www.eia.gov/environment/emissions/co2_vol_mass.php [last accessed 0/522/2021]*

† Roughly half of class 2b vehicles use diesel. Environmental damages of class 2b are estimated as the average of the per-mile damages for LDVs and trucks.

SCENARIOS

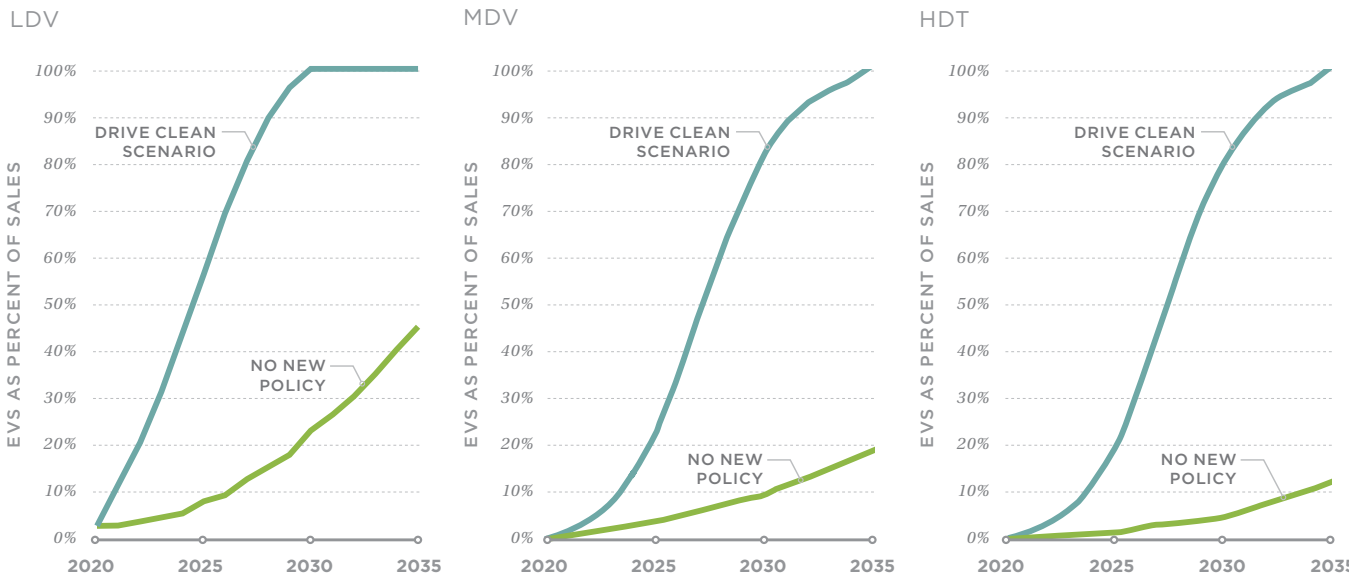
Our analysis evaluates the two scenarios described below, the No New Policy and the DRIVE Clean scenarios.

No New Policy

No New Policy is a business-as-usual scenario in which electrification of the nation's fleet proceeds as determined by current market forces without assistance from new state or federal policies. This scenario assumes that 2020 state and federal policies continue and that the current barriers to EV adoption persist. Barriers include underdeveloped charging infrastructure, higher upfront price premiums, no widespread adoption of EV-specific electricity rates, low levels of consumer awareness and acceptance, few policies aimed at addressing equitable access to EVs, and poor accounting for the societal advantages of EVs over conventional vehicles. In this scenario, by 2035 EVs constitute about 45% of new LDV sales, 38% of new MDV sales, and 12% of new HDT sales. The scenario is based on projections from BNEF, which suggest that—absent policy intervention—ICE vehicles will constitute 46% of the on-road vehicle population by 2050 (McKerracher et al. 2021). In that scenario, the electric grid decarbonizes as determined by current state and federal power-sector policies. This business-as-usual approach closely mirrors the projections of NREL's standard scenarios, in which the percentage of clean (carbon-free) electricity reaches 47% by 2035 (Cole et al. 2020).

Drive Rapid Innovation in Vehicle Electrification (DRIVE Clean)

DRIVE Clean is a scenario that projects that EVs constitute 100% of U.S. LDV sales by 2030 and 100% of MDV and HDT sales by 2035. The DRIVE Clean scenario assumes new policies are adopted and market forces shift to quickly overcome EV-related barriers. EV sales scale logarithmically to 100% between 2020 and the target year. By 2050, EVs constitute 97% of all on-road vehicles. In this scenario, all coal-fired power plants retire by 2030, no new natural gas plants are built, and the electric grid reaches 90% clean electricity nationwide by 2035—similar to the situation detailed in the first 2035 Report (Phadke et al., 2020). **Figure 16** shows EV sales as a percentage of total vehicle sales under each of the two scenarios.



FIGURES 16.

EVs as a percentage of vehicle sales under the No New Policy and DRIVE Clean scenarios

APPENDIX 3

DETAILED RESULTS

SUMMARY OF RESULTS

The methodologies and assumptions presented above directly affect total cost of vehicle ownership, vehicle stock turnover, and the total cost of the vehicle fleet across all classes. Those inputs, which impact the cost and environmental benefits of the transition from ICE vehicles to EVs, have significant implications for the overall results of our electrification analysis. This appendix also analyzes two sensitivity cases to highlight the effects of key assumptions on vehicle costs and overall trends in decarbonizing transportation.

TOTAL COST OF OWNERSHIP

For each of the six vehicle classes, we calculate a per-mile TCO for both ICE vehicles and EVs. The TCO includes upfront costs, fuel costs, maintenance, health and environmental damages attributable to the grid or to tailpipe emissions, and, for EVs, the cost of establishing charging infrastructure nationwide. **Figure 17** shows the components of the TCO for the six classes of EVs and ICE vehicles.

FIGURE 17.

Total cost of ownership by class and vehicle technology (coninued on next page)

In the early 2020s, ICE LDVs have a TCO advantage of roughly $0.05 per mile, although that drops to $0.02 per mile when accounting for environmental and health damages. Because LDVs have a relatively low VMT compared to heavier vehicle classes, the TCO advantage of ICE vehicles is driven by high upfront costs of EVs, which constitute 77% of their total TCO. Our model indicates, however, that given the forecasted dramatic decline in battery prices, light-duty EVs will reach upfront cost parity with their ICE counterparts within 5 years. Between 2020 and 2030, the per-mile upfront cost of EVs is predicted to decline from $0.24 to $0.14—a $20,000 difference in TCO during the vehicle's

FIGURE 17.

Total cost of ownership by class and vehicle technology (coninued from previous page)

lifetime. Additionally, the operating costs (maintenance and fuel) of light-duty EVs are only 41% those of ICE vehicles. Although upfront cost is a major consideration in vehicle ownership, this analysis suggests that EV buyers will start saving money almost immediately. The faster upfront costs fall, the sooner consumers will realize the TCO savings.

Our analysis suggests that, even when excluding environmental damages, TCO parity already has been achieved for electric MDVs and HDTs. The cost competitiveness of EVs in heavier categories is driven by the large annual VMT and corresponding operational savings from fuel switching and by lower maintenance costs. We estimate that in the early 2020s, for example, per-mile electricity costs for HDTs ($0.13) are 53% those of their diesel counterparts. Maintenance costs are also lower, although those savings are partly offset by the cost of eventual battery replacements and charging infrastructure. Although the upfront cost of heavier classes of EVs does not affect the TCO as it does for LDVs, all classes of MDVs are expected to reach cost parity with ICE vehicles by 2030 or sooner. HDTs are expected to achieve near-parity by the early 2030s. It is important to consider the high cost of environmental and health damages when comparing the TCO of heavier-duty vehicle classes. Those classes contribute an outsized percentage of ground transport-related air pollution and CO_2 emissions relative to their numbers. Environmental damages account for roughly 25% of the total TCO for class 7-8 tractors throughout the 2020s. In 2035, this percentage is equivalent to $229,000 in health and environmental damages over the lifetime of the vehicle, compared to only $6,000 for an electric class 7-8 tractor fueled by a 90% clean grid.

STOCK TURNOVER

Under the DRIVE Clean scenario we take as inputs the 2020 vehicle population, projections of annual vehicle sales, and electric vehicle sales targets. The stock turnover model estimates the number of EV and ICE vehicles sold annually and the composition of vehicle stock. **Figure 18** illustrates the dynamics of vehicle sales and stock by class under the DRIVE Clean and No New Policy scenarios. The green represents the stock and sales of EVs that would go to ICE vehicles under the No New Policy scenario.

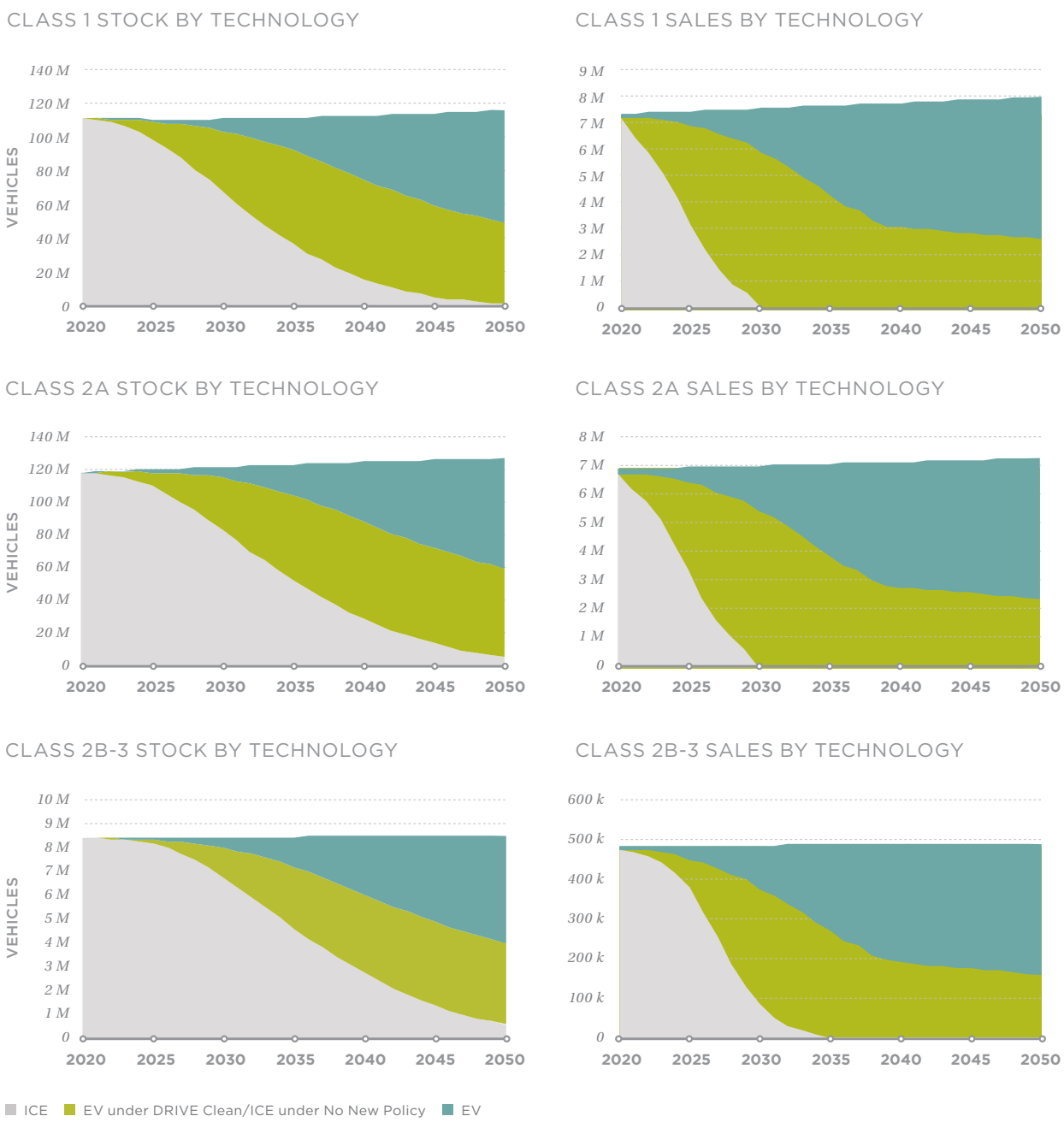
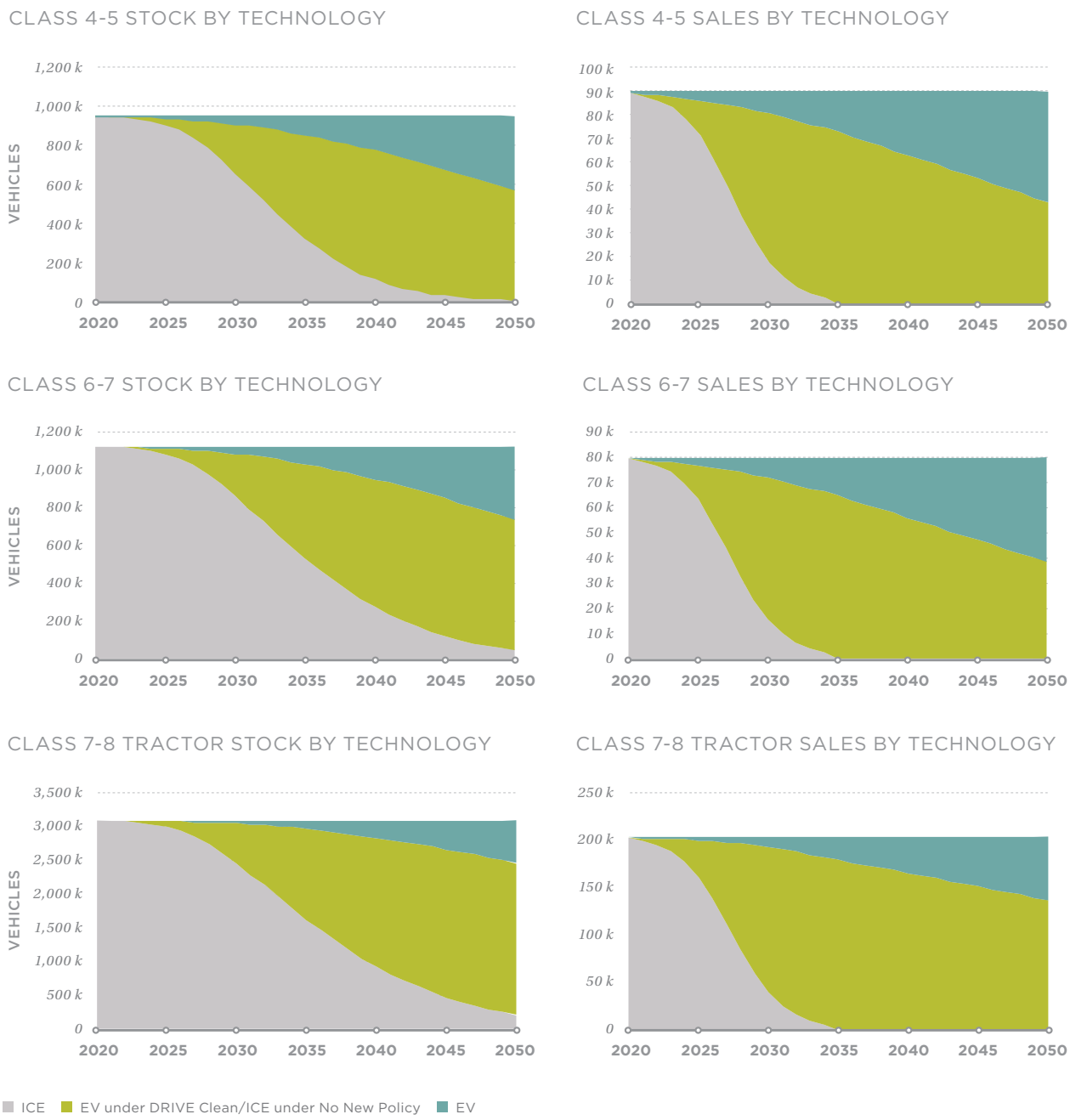


FIGURE 18.

EV and ICE vehicle stock and sales by class under No New Policy and DRIVE Clean scenarios (coninued on next page)



The penetration of light-duty EVs in the No New Policy scenario, projected to be about 67% of sales in 2050, is higher than that of heavy-duty EVs (33% of sales in 2050). Given the large population of light-duty class 1 and 2a vehicles, the DRIVE Clean scenario, with its target of 100% electric LDV sales by 2030, results in 202 million would-be ICE sales being converted to EVs between 2020 and 2050. Although the population of HDTs is smaller, at 3.9 million, it represents a larger percentage (61%) of total sales than do LDV sales (44%).

There is an enormous difference between the DRIVE Clean and No New Policy scenarios vis-a-vis the number of ICE vehicles remaining in the

FIGURE 18.

EV and ICE vehicle stock and sales by class under No New Policy and DRIVE Clean scenarios (coninued from previous page)

national fleet in 2050. Under the No New Policy scenario, in 2050 ICE vehicles account for 43%-47% of LDVs, 47%-65% of MDVs, and 80% of HDTs. Under the DRIVE Clean scenario, those figures are reduced to 1%-5% for LDVs, 1%-7% for MDVs, and 7% for HDTs. The high percentage of MDVs and HDTs that remain in the national fleet reflects the longer service life of those vehicles, which makes it especially important to encourage early uptake of EVs in those vehicle categories.

SENSITIVITY ANALYSIS

We include two sensitivity cases to confirm the robustness of our results even if electricity rates increase or gas and diesel prices decrease. In the sensitivity case that evaluates low fossil fuel prices, we model a decrease in gas and diesel prices of 30% relative to the base case. In the sensitivity case for high electricity price, we assume approximately 40%, 18%, and 41% increases in per-kWh charging tariffs for LDVs, MDVs, and HDTs, respectively.

Figure 19 illustrates the effects of the two sensitivity cases on TCO for the six classes of vehicles.

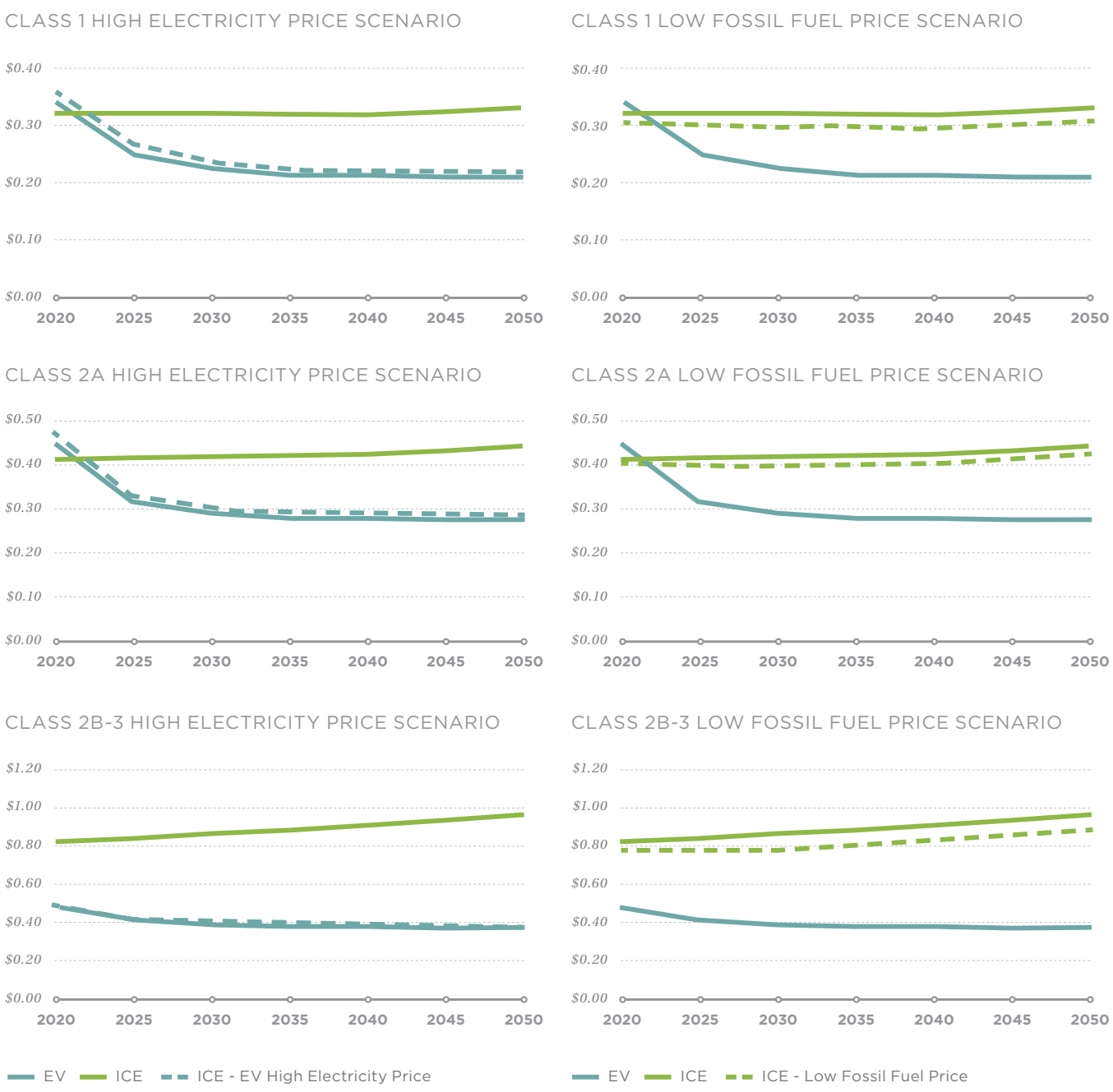
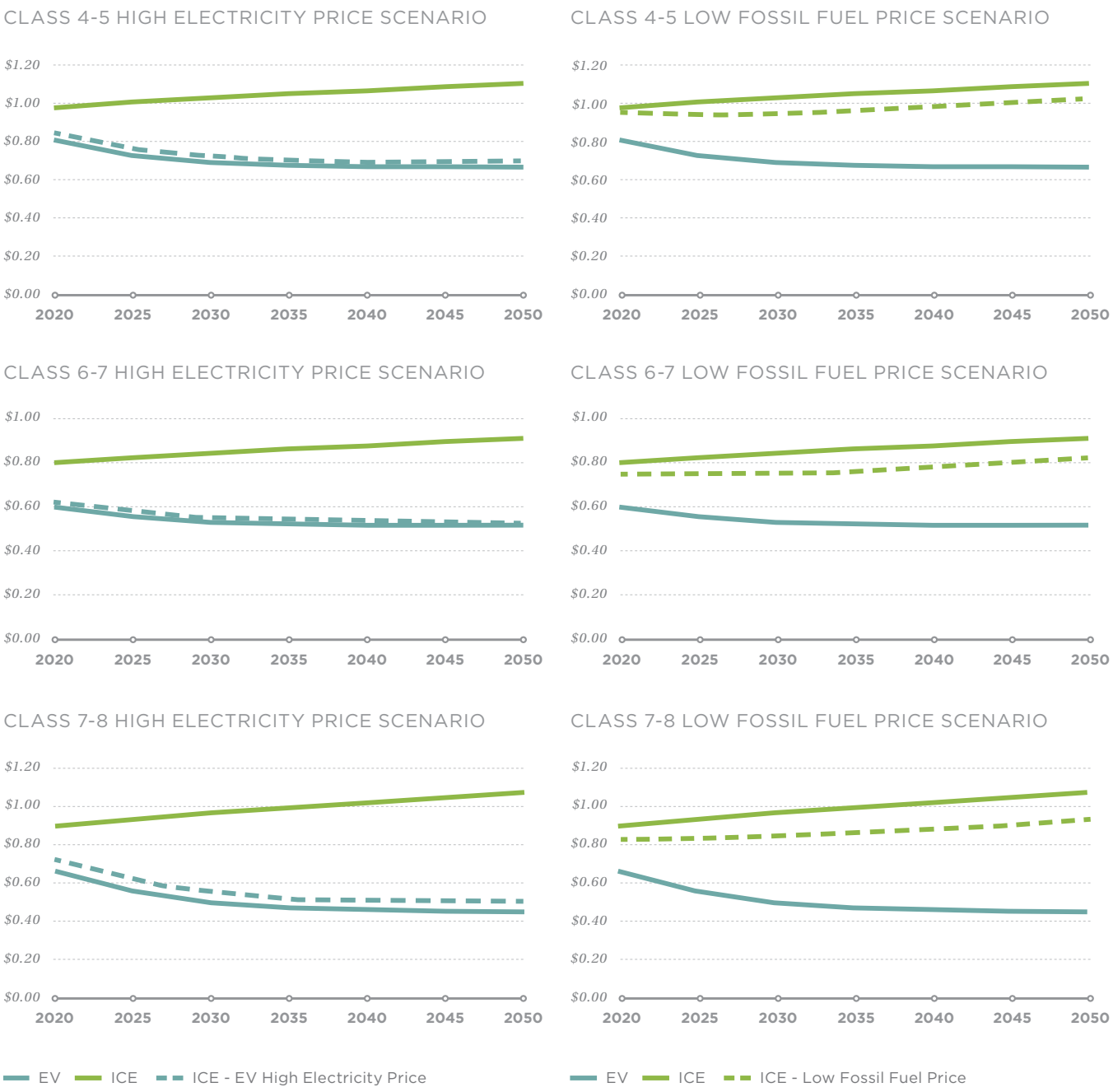


FIGURE 19.

Effects of sensitivity cases on TCO by vehicle class *(coninued on next page)*



We find that the EV-adverse scenarios have only a small effect on their TCO competitiveness. The impact of the sensitivity cases on the TCO of comparative EV and ICE vehicles depends on the operational characteristics of the vehicle class. In either sensitivity case, lighter classes of vehicles experience a modest increase in TCO that delays parity by at most 1 to 2 years. For class 1 passenger vehicles, the sensitivity analyses find that higher electricity prices or low gasoline prices increase TCO by $0.01 and $0.02, respectively. For heavier vehicle classes, which have more annual VMTs, higher electricity rates or lower fossil fuel prices more strongly affect savings from fuel switching.

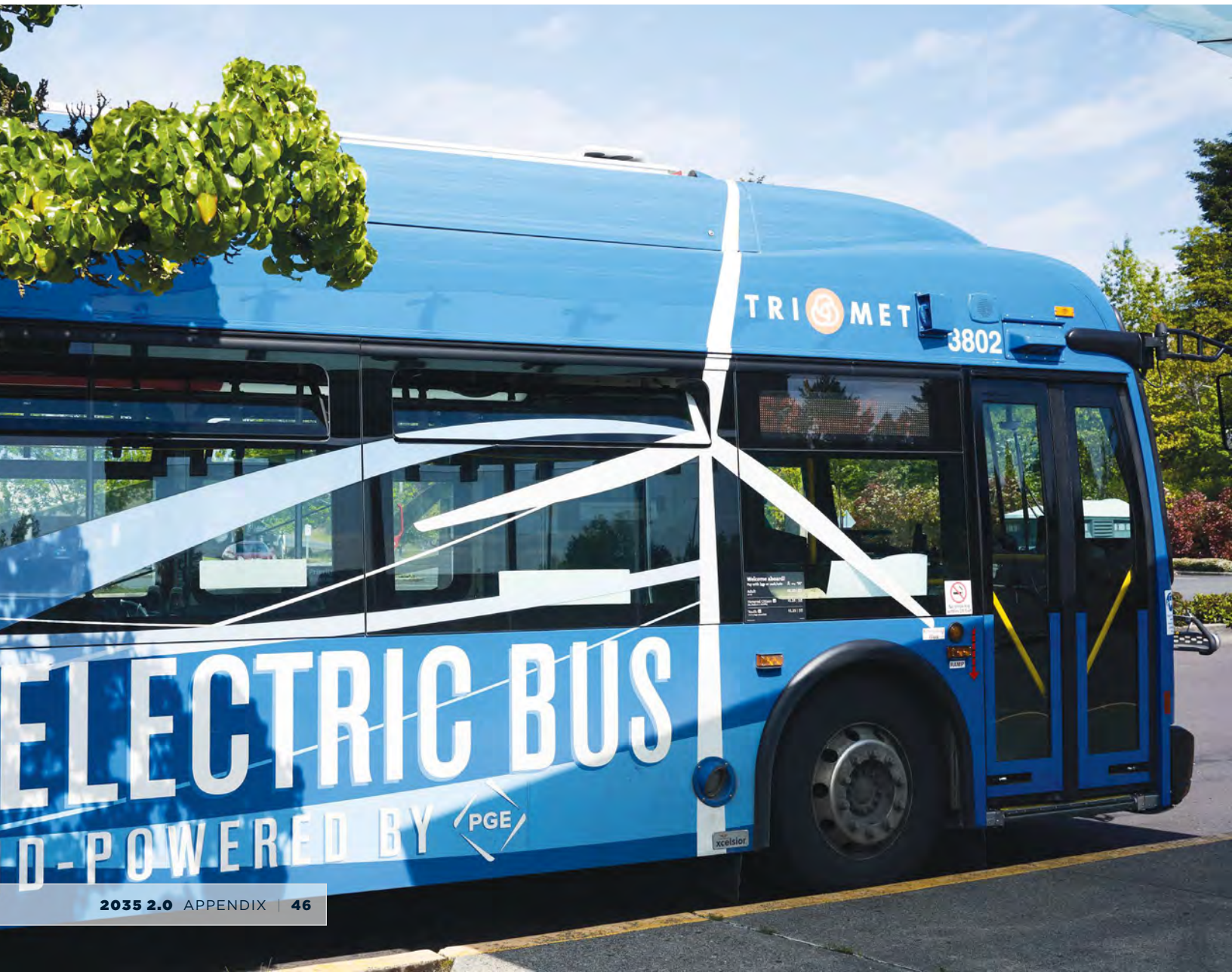
FIGURE 19.

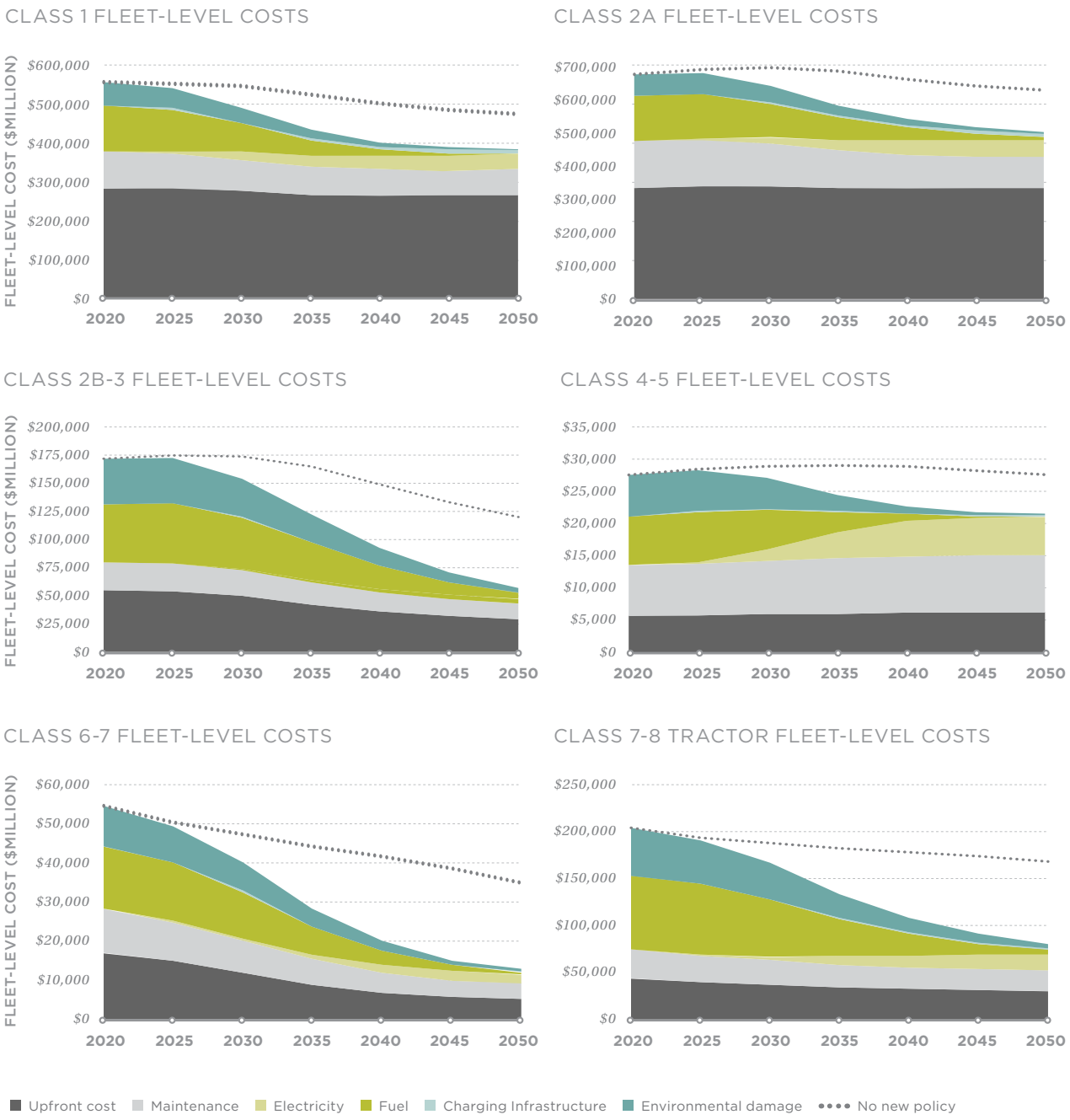
Effects of sensitivity cases on TCO by vehicle class (continued from previous page)

For class 7-8 tractors, we find that a 41% increase in electricity prices produces an $0.05 increase in TCO for EVs and that a maximum 30% decrease in diesel prices increases EV TCO by $0.12. Our analysis shows, however, that the TCO of medium- and heavy-duty EVs is already lower under these adverse economic scenarios. Furthermore, future decreases in capital costs resulting from improvements in battery storage economics will fully offset any increases in fuel expenses.

FLEET-LEVEL COST ESTIMATION

The TCO savings realized at the individual consumer level translate into economy-wide savings at the fleet level. **Figure 20** compares fleet-level costs by class under the DRIVE Clean and No New Policy scenarios.





Including all vehicle classes, the savings under the DRIVE Clean scenario total $3.4 trillion, including the savings in health and environmental damages. Although some fleet-wide savings result from decreasing upfront and maintenance costs, those trends are offset partly by a naturally evolving increase in vehicle population during the study timeframe. Despite the increase in EV population, the DRIVE Clean scenario indicates savings across all classes from 2020 to 2050, including a 12%-13% reduction in total fleet costs for LDVs, 13%-30% for MDVs, and 24% for HDTs.

FIGURE 20.

National fleet-level costs by vehicle class under the No New Policy and DRIVE Clean scenarios

Across all classes, the largest savings—42% of the total—derive from fuel switching. The savings are greater for heavier vehicle classes having larger annual VMTs, such as class 6-7 vehicles and class 7-8 tractors. Applying the DRIVE Clean scenario, we observe a decrease in fuel costs of 31% for class 7-8 tractors compared to 27% for light-duty class 1 vehicles. For all classes, costs attributable to environmental damages decline 33%-50% under the DRIVE Clean scenario compared to the No New Policy scenario, as shown in **Figure 21**. LDVs contribute 54% of the total reductions, MDVs 22%, and HDTs the remaining 24%.

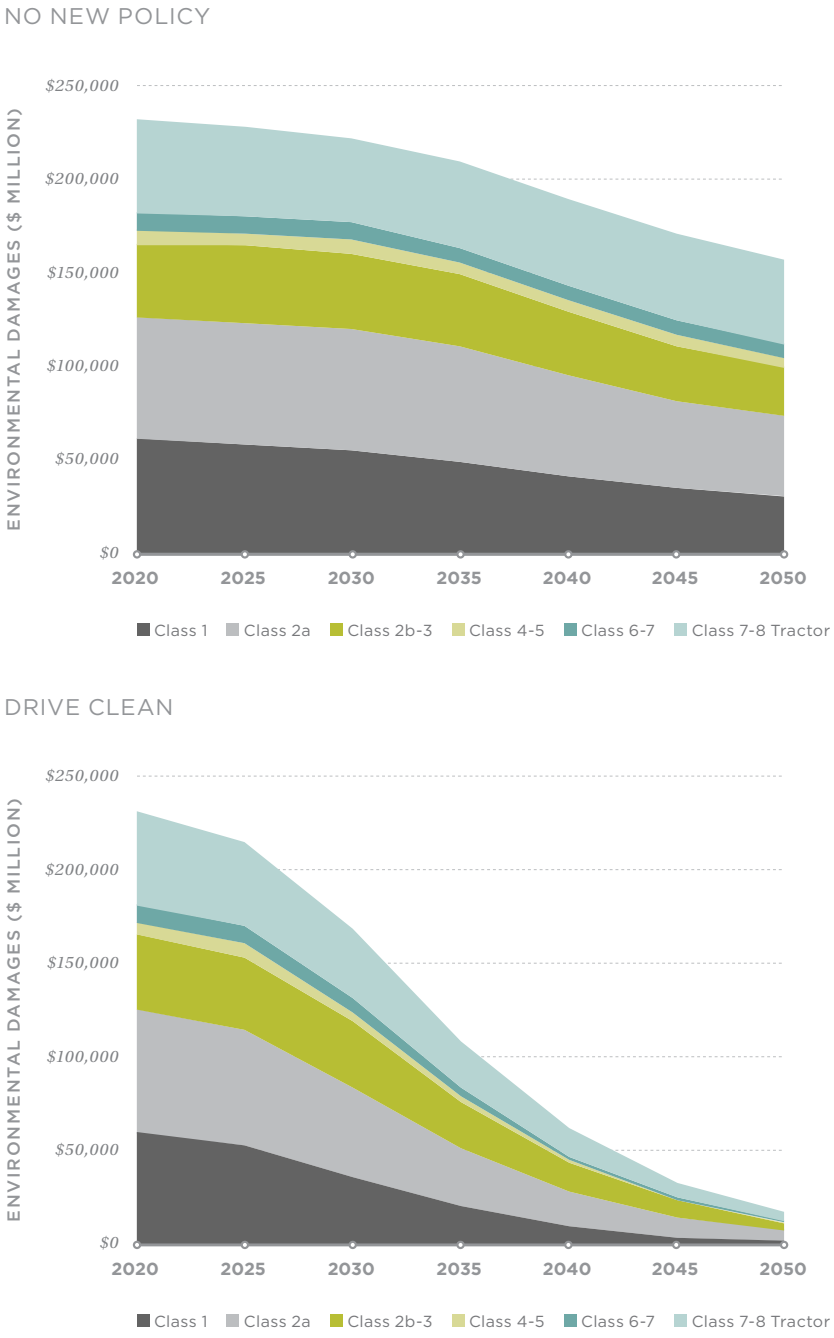


FIGURE 21.

Comparison of health and environmental damages under the No New Policy and DRIVE Clean scenarios

GRID IMPACTS

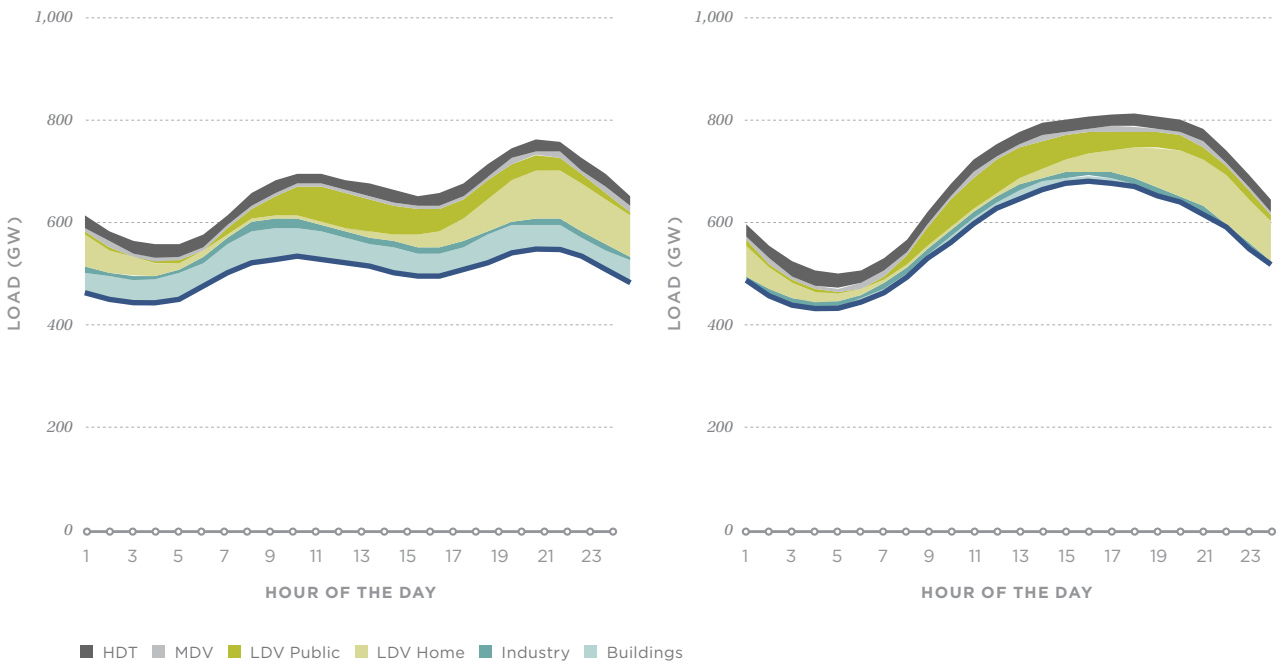
We evaluate effects on the electrical grid of increasing EV populations. We examine effects on system operations, load, and generation, the role of natural gas, the role of battery storage, the regional distribution of clean energy investments, and the potential of smart charging.

System Operations, Load, and Generation

System loads nationwide will increase significantly because of the projected electrification of the transportation, building, and industrial sectors. Electrification of transportation contributes more to load increases than does electrification of the building and industrial sectors, primarily because of the faster stock turnover rates. Load shapes vary significantly by sector and the use case within the sector. Most of the LDV home charging in our model occurs during evening/night hours, while most of the LDV public charging occurs during the day and evening. MDV and HDT charging occurs throughout the day and the load curve is largely flat. Building electrification load, which is mainly heating, peaks primarily in winter. Commercial building heating has the effect of shifting the building electrification load peak to the middle of the day in winter. Industrial electrification load is largely flat through all seasons and hours of the day. **Figure 22** shows the additional hourly electricity demand in 2035 due to electrification in the DRIVE Clean case.

FIGURE 22.

Average additional hourly electric load in 2035 under the DRIVE Clean scenario (left: January, right: July). All hours are EST.



To model the operation of a low-carbon power system, we examine hourly dispatch at the power plant level throughout the United States. ReEDS is used to assess capacity expansion during the study years, while PLEXOS is used to model hourly operations in 2035. Weather is a key factor in electricity demand—it affects both demands from buildings and the output of wind and solar generators. We incorporate seven years of weather data, from 2007 to 2013, to cover a range of probable conditions. In the future large amounts of solar and wind power will produce significant changes in daily supply and demand profiles. Even in the No New Policy case, solar and wind sources are expected to expand to 39% and 34%, respectively, of national electricity generation by 2035, with higher levels in some regions. The DRIVE Clean scenario pushes solar and wind generation up to 39% and 34%, respectively, of national electricity supply. Because solar is a daytime-only resource, California's current phenomenon known as the duck curve will be endemic to all power systems. The duck curve is so named because the shape of the load profile resembles the profile of a duck. The curve features low net demand during midday hours, followed by a large and rapid ramp-up to the net peak period in the early evening, when the sun fades as electricity demand does. The extent of the afternoon ramp-up and timing of the net peak depend on regional weather patterns and especially on air conditioning load as a percent of total demand. The outputs from wind and solar sources in a given region typically are not correlated, and sometimes can even be synergistic. In most regions, wind sources typically peak in the evening or nighttime, but have significant variability in hourly and daily output. During summer peak load periods (July/August), wind energy resources decrease significantly, while during winter peak load periods (December-February), solar energy resources decrease significantly. Regions that have an advantageous balance of wind and solar may show a less dramatic duck curve than do solar-dominated systems.

Utilizing large amounts of renewables can require some curtailment of wind and solar generation during periods of excess generation relative to demand. Although energy storage may absorb substantial amounts of the excess generation, saving it for use in hours of lower generation, a point comes when the long-run marginal cost of adding more storage outweighs the cost of wasting clean generation. It costs less, in short, to pay producers for their curtailed power than to install enough storage to eliminate curtailment. Our model includes the full annualized cost of wind and solar, including the costs of curtailment. Under the DRIVE Clean scenario, wind and solar are found to be reasonably synergistic at the national level, combining to provide around-the-clock supply on average. The lowest wind output is in the summer months (July and August), when the shortfall is made up by higher solar output and greater dispatch of gas generators. Similarly, in winter (December/February), when solar output drops significantly, wind generation and gas dispatch increase. Batteries can be charged during the day,

then discharged for the evening peak load, reducing dispatch of gas generators. The use of batteries is most pronounced in summer months. Curtailment is highest in spring (March/May), when wind and solar generation increase while electricity demand for space cooling has not yet started. Curtailment is nearly absent in peak summer months (July and August), owing primarily to the high afternoon demand and a significant drop in wind generation.

ROLE OF NATURAL GAS

This study incorporates the novel strategy of using already built gas-fired power plants—sparingly—along with low-cost storage—to fill the gaps in wind and solar generation. Thanks to the broad availability of wind, solar, and other clean assets such as nuclear and hydropower, the gas-fired plants need operate infrequently and thus produce few emissions. ReEDS modeling retires gas plants only at the end of their technical life rather than for economic reasons; under the DRIVE Clean scenario ReEDS retains about 450 GW of gas capacity in 2035. Transferring that capacity to PLEXOS, which evaluates hourly operational feasibility throughout seven weather years, results in a maximum of 311 GW of gas capacity used in 2035. This amount is about 60% of the 540 GW of gas capacity currently operating in the United States. Because no new gas capacity is needed to meet electricity demands, this strategy creates significant cost savings while moving to a clean energy future. Gas is especially useful for periods of high net load such as summer afternoons (high demand and little wind generation) or winter (high demand and little solar generation). The overall load is smaller in winter than in summer. In the solar-heavy renewable energy configuration that we project, however, the overall renewable generation in winter drops significantly, resulting in a high net load. Based on seven years of weather data across the United States (2007-2013), PLEXOS found the hourly need for gas generation tends to be highest in both the peak summer (July/August) and winter (January-February) months. In the DRIVE Clean case for 2035, the highest gas dispatch in the seven weather years occurs in weather year 2010 on February 2 at 7 AM Eastern Time, at 311 GW, as shown in **Figure 23**. More than 70 GW of the natural gas capacity gets dispatched during less than 1% of the operating time, as shown in **Figure 24**.

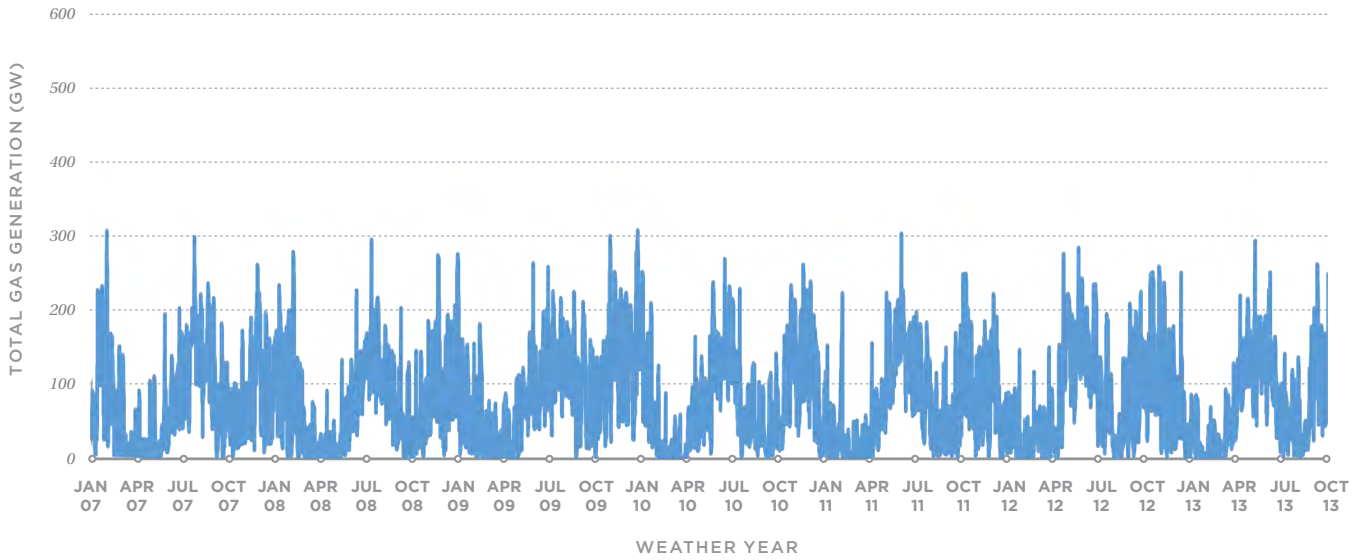
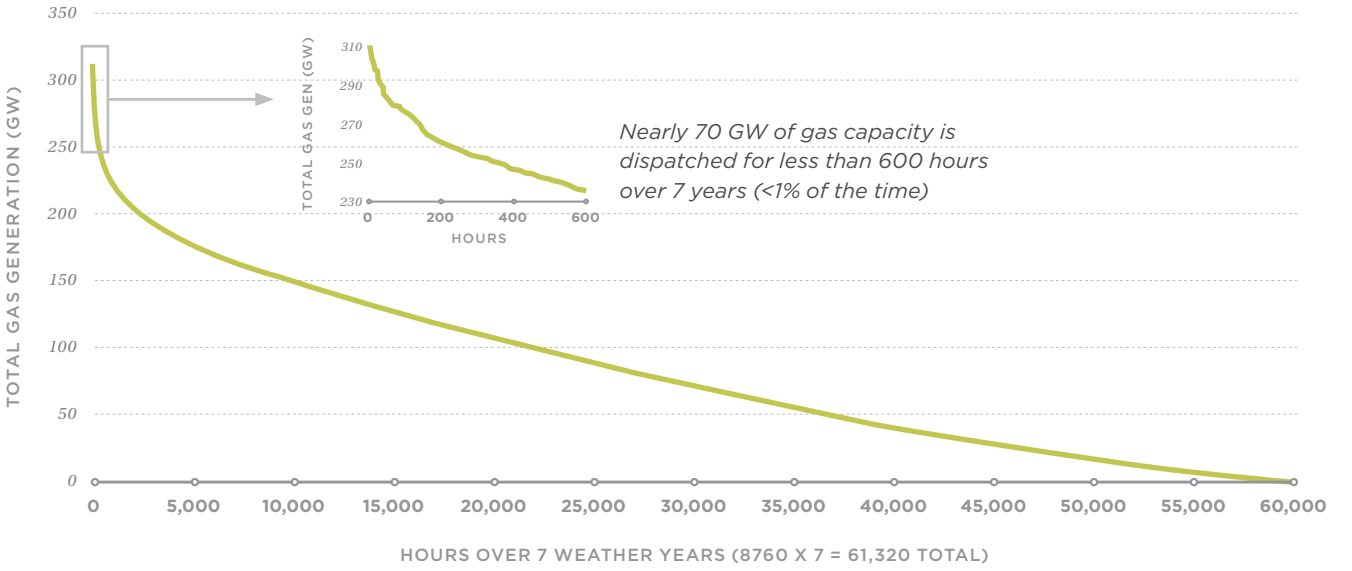


FIGURE 23.

Total gas generation in 2035 over seven weather years



ROLE OF BATTERY STORAGE

FIGURE 24.

Total gas generation duration curve in 2035 over seven weather years

Batteries can provide the grid with diurnal balancing because they generally charge during the day and discharge during the evening and early morning. Batteries are crucial for meeting loads during evening and night hours, when most EV home charging occurs. We estimate that by 2035, 425 GW (~2600 GWh) of battery storage capacity will be required to operate the grid cost-effectively. More specifically, we find the need for 31 GW of 2-hour batteries, 70 GW of 4-hour batteries,

156 GW of 6-hour batteries, 160 GW of 8-hour batteries, and 9 GW of 10-hour batteries by 2035. The role of batteries is crucial in meeting the load during evening and night hours, particularly because most of the EV home charging load takes place during those hours. Batteries generally charge during the day and discharge during the evening and early morning and are critical for providing diurnal balancing to the grid. Their role in providing the seasonal balancing (e.g. shifting the excess renewable generation during spring months to high-demand summer months or low-RE winter months) is rather limited.

REGIONAL DISTRIBUTION OF CLEAN ENERGY INVESTMENTS

The quickly and steeply decreasing cost of wind and solar energy renders investments in renewable energy cost effective throughout the country, including in states that have significant coal and gas capacity. Those investments will provide significant job gains and opportunities during the transition from fossil fuels. **Figure 25** shows locations by state for investments in new renewable energy and storage capacities (2021-2035). **Table 8** summarizes the investments in new clean energy resources for the top 15 states under the DRIVE Clean scenario.

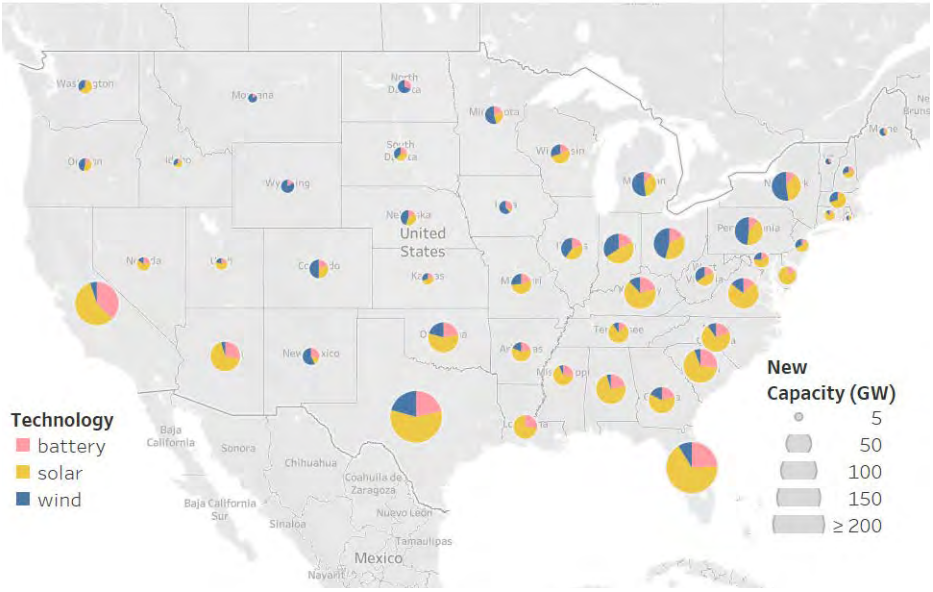


FIGURE 25.

Cumulative new renewable energy and storage capacity by state (2021-2035)

TABLE 8.

Investments in new clean energy resources by the top 15 states under the DRIVE Clean scenario (2021-2035 total)

STATE	NEW INVESTMENTS IN WIND, SOLAR, AND STORAGE (GW)	NEW INVESTMENTS IN WIND, SOLAR, AND STORAGE ($ BILLION, 2020 REAL)
Texas	242	277
Florida	194	221
California	140	168
New York	64	97
South Carolina	85	96
Ohio	72	88
Kentuky	75	85
Virginia	69	82
Indiana	67	79
Oklahoma	68	79
Arizona	64	76
Pennsylvania	57	74
Alabama	64	66
North Carolina	62	65
Georgia	51	61

All regions of the country could experience significant economic activity from deploying local renewable energy generation and storage capacity. The transition from fossil fuel generation, however, may disrupt the lives of some workers and communities that rely on jobs and tax revenue from fossil fuel production and power generation. Policies implemented to decarbonize the power sector should include measures to support transitions to a lower-carbon economy. Research suggests that wind and PV plants can be built close to many retiring coal plants, helping to provide new economic opportunities in affected communities (Gimon et al. 2021). Support for economic redevelopment and diversification beyond the clean energy industry also can help make a smooth transition from fossil fuels.

ROLE OF SMART CHARGING

EV charging load peaks (at about 150 GW nationally) in the evening at about 8-9 pm EST. The primary driver is LDV home charging (about 90 GW nationally). Although our simulations did not model EV smart charging, several other studies have shown that smart charging of EVs could offer significant grid benefits—particularly for managing the evening peak load, net load ramp ups after solar hours, and investments in the distribution system. There are three ways in which smart charging of EVs would benefit the system.

(a) The LDV home charging load could be delayed by 3 to 4 hours so the charging load does not coincide with the evening peak load. Most passenger cars already provide a range of 200 to 300 miles, which is significantly more than LDVs average in a day. Because the cars may still retain significant range when they arrive home in the evening, EV drivers may be willing to delay home charging.

(b) Charging of HDTs and MDVs could be shifted primarily to solar hours. Doing so would offer the possibility of signing long-term solar purchase agreements, which would provide nominally fixed and low charging costs and offer significant hedge against fluctuating oil prices.

(c) Smart charging of EVs that shifts the charging demand away from system peak hours could help with cost-effectively managing the distribution system upgrades that may be needed for meeting the overall demand for additional electricity. This potential benefit would arise because investments in distribution systems are determined primarily to meet peak load. Additional analysis is needed to assess in detail the role of smart charging and its economic benefits.

APPENDIX 4

MANUFACTURING CAPACITY AND COMMITMENT

This appendix describes the conditions necessary to support and further the production of EVs, including manufacturing the vehicles themselves, producing the batteries required for EV operation, and obtaining and processing the necessary raw materials.

ELECTRIC VEHICLE MANUFACTURING

Governments in the EU, China, India, Japan, Korea, and Canada all provide direct financial support for EV and battery manufacturing. The financial support typically is combined with other EV policies, such as emissions standards, limitations on ICE vehicles, and consumer purchase incentives.

In the United States, President Biden has proposed $174 billion dedicated to charging infrastructure, tax credits, federal procurement, consumer incentives, and other policy measures to expand domestic EV production and sales.[16] Global and domestic manufacturing supply chains already have begun to ramp up aggressively to meet new EV demands.

The federal government must structure its policies so that transportation decarbonization creates new American manufacturing jobs. Consumer incentives to purchase EVs will not, by themselves, effectively increase domestic employment. Policies that address only sales demand risk relying heavily on imported products, as is the case with solar cells. EV and battery manufacturing are at risk of following the same path, but there remain opportunities to seed substantial battery and EV manufacturing in the United States.[17] The United States needs an industrial policy on EV and battery manufacturing that addresses both supply and demand.[18] According to the ICCT, nearly three-quarters of EVs sold in the United States were produced in one region, suggesting

16 See Biden/Harris website. https://joebiden.com/made-in-america/ [last accessed 05/22/2021]

17 A related issue is that federal R&D spending is needed to provide domestic production of raw materials. See Energy Department Selects 15 Projects to Advance Critical Material Innovations. [last accessed 05/22/2021]

18 The U.S. is one of the few major auto powers that lacks a serious EV manufacturing strategy. See *Industry Week's* May 21, 2020 "Time for a Serious US Electric Vehicle Manufacturing Strategy." [last accessed 05/22/2021]

the necessity of a strong demand-side market strategy.[19]

United States-based manufacturers have announced plans to spend at least $34 billion investing in domestic EV and battery manufacturing. In the United States it takes 2 to 5 years to construct a large-scale vehicle manufacturing plant, from ground- breaking to production. Tesla is developing an electric pickup truck plant in Austin, Texas, at a site chosen in mid-2020 that will begin production in 2021 or 2022. Tesla's factories in development in Berlin and Shanghai are on similar two-year construction schedules. Ford announced in February 2021 that it will invest $29 billion in autonomous and electric vehicles through 2025.[20] Ford already has invested $700 million and broken ground for a new high-tech manufacturing center at its Rogue Complex in Michigan. The expansion is dedicated to its all-new, all-electric F-150 pickup truck, projected to come to market in mid-2022. The Lordstown Motor Corporation, which purchased a closed GM plant in Ohio in 2020, has 100,000 pre-orders for EVs, expects to produce 50,000 light trucks in 2022, and can scale production at that site to 600,000.[21] Meeting the goal of all EVs sold in America being American-made by 2030 will require establishing, in the next 10 years, about 26 to 30 EV manufacturing plants at a scale similar to Lordstown's Ohio plant.

GM will need many EV plants operating by 2030 to meet its ambition to sell only EVs by 2035.[22] Volkswagen has a recently converted Zwickau plant that will produce only its electric ID.3 brand and has plans for a new EV production plant in Tennessee (see note[19] above). The company hopes to make 75% of its new cars EVs by 2030. Fiat-Chrysler plans to launch more than 30 EV and hybrid products by 2022 and will invest heavily in electric vehicle manufacturing in the United States.

Along with building new manufacturing facilities, the required production can be achieved by converting existing vehicle manufacturing sites. Assuming the availability of batteries, converting such sites to EV production can happen faster than developing a greenfield site. Tesla purchased a closed vehicle manufacturing plant in Fremont, California, in 2010 and produced its first vehicle in 2012. In 2020 it employed 10,000 workers there producing 500,000 Teslas (NS Energy 2020).

Electric medium-duty vehicles and heavy-duty trucks present another opportunity to bolster U.S. manufacturing capability. More than 125

19 See ICCT's May 2018 "New study shows where the auto industry is primed for the transition to electric vehicles." [last accessed 05/22/2021]

20 See *Washington Post's* February 2021 "Auto industry peers into an electric future and sees bumps ahead" [last accessed 05/22/2021] and *Industry Week's* April 2021 "Ford's commitment to battery innovation is far from shocking." [last accessed 05/22/2021]

21 See YouTube video February 2021. "Electric Truck Series Part 1 - Lordstown Motors." [last accessed 05/22/2021]

22 GM already has extensive experience with EV manufacturing from its large market share of EVs in China. In late 2020 its Wuling brand Hongguang Mini became the top-selling EV in China. Sales of GM's Chevrolet Bolt in the United States doubled in the fourth quarter of 2020 from a year earlier.

zero-emission MDVs and HDTs are in production, development, or demonstration in the United States (Sharpe et al. 2020). Volvo has invested heavily in its electric Class 8 heavy-duty truck. Daimler has invested $20 million in a Detroit ePowertrain manufacturing facility. Dana, Cummins and Meritor are investing in manufacturing heavy-duty truck and bus components. Proterra, China's BYD, and others are producing electric buses in the United States. A parallel set of investments is occurring in domestic battery manufacturing.

Although the challenge of drastically ramping up American EV manufacturing may seem daunting, historical and international precedent supports the feasibility of the endeavor. China's explosive vehicle manufacturing growth demonstrates that government support is key to EV manufacturing. For example, in the nine years from 2000 to 2009, China ramped up its production of ICE vehicles from 2 million to almost 14 million and, for the first time, surpassed U.S. auto production. It began producing significant numbers of EVs only in 2013, but has invested nearly $60 billion in the industry, which now produces about 1.33 million passenger EVs (both battery-only and hybrid) (International Energy Administration 2020). China also produces 90% of the world's electric buses. The United States is not far behind, and a well-organized set of policy and financial supports can put the United States back in a leadership position.

A similar situation is occurring in the European Union. The EU has launched policy initiatives to ramp up sales of passenger EVs. Europe's global share of the electric vehicle market climbed sharply from an annual average of 3% in 2019 to about 8% in early 2020, surpassing even China in sales of electric and plug-in hybrid vehicles. Norway, where EVs make up 46% of the country's vehicle fleet, is the global leader in size of EV market share. Volkswagen is investing $37 billion globally in its EV program and has committed to sell 28 million electric cars by 2028. Similar stories are found in other parts of the world. In 2018, Japan launched a mandate to achieve 100% electric vehicle sales by 2030.[23] South Korea's EV market is forecast to grow by a compound annual rate of 19% between 2019 and 2025.[24] Given ambitious and thoughtful federal policy support, the United States also can build a thriving new domestic electric vehicle manufacturing industry.

23 See January 2021 "IHS Markit forecasts global EV sales to rise by 70% in 2021." [last accessed 05/22/2021]

24 See February 2020 Orion Market Research's "South Korea Electric Vehicle Market Size, Share & Trends Analysis Report... and forecast 2019-2025." [last accessed 05/22/2021]

BATTERY MANUFACTURING

The critical component of electric vehicles, batteries, requires a separate dedicated manufacturing capacity and supply chain. Global demand for lithium-ion batteries, which represent about 300 GWh today, will increase dramatically, particularly if the United States pursues an aggressive vehicle electrification strategy. Analysis of the current and projected battery manufacturing landscape suggests that global manufacturing capacity can ramp up to meet demand. Industry announcements for new and expanded battery manufacturing facilities promise more than 500 GWh in new global capacity by 2022 and nearly 1,000 GWh by 2025 (up from 95 GWh in 2019). Germany, which achieved a national EV market share of 17.5% in October 2020, has committed $1.1 billion to fund EU battery production. France developed an $800 million action plan to support the battery value chain. The planned expanded production of battery cells and packs far exceeds the needs of near-term electric vehicle mandates from around the world.

The United States has an opportunity to participate in the battery production race, partly because, while currently lagging other countries, it is not starting from zero. Current U.S. production of lithium-ion batteries is about 60 GWh, or approximately 13% of global production (Gul et al. 2020). BNEF projects that U.S. lithium-ion battery production will quadruple by 2025 (McKerracher et al. 2021). Numerous battery manufacturers are investing heavily in domestic production. LG Chem, for example, will invest more than $4.5 billion between now and 2025 in its U.S. business to bring annual domestic production capacity to more than 110 GWh. One of its battery plants, a joint venture with GM, involves $2.3 billion of investment in a 35-GWh plant in Ohio that is expected to open in 2022. Ford is making a $185 million investment in its new global battery research center, while Sila Nanotechnologies plans to build a factory in the United States to make the silicon anode materials to supply batteries for more than one million EVs annually. SK Innovation is completing work on $2.6 billion worth of U.S. battery manufacturing facilities, which will employ 1,000 workers by the end of 2021 and 2,600 by 2024, when they expect to produce batteries for more than 300,000 EVs annually. Tesla has several large battery manufacturing plants in operation or advanced development, while Novonix is producing synthetic graphite for battery cells at a factory in Tennessee.

Several factors encourage optimism that the United States, given strong policy support, can supply much of its own demand for EV batteries. First, economics strongly favor battery manufacturing near EV sales markets because batteries are heavy and expensive to transport. Labor, which is traditionally more costly in the United States, is only a small part of battery manufacturing costs. Those factors make the United States a competitive place to manufacture batteries if governmental

policy drives an increase in EV demand and sales. Second, financial incentives to both buy and produce in America[25] can substantially increase U.S. lithium-ion battery production by 2030. Third, the United States has a technical lead in developing solid-state lithium batteries, which may offer lower costs and operational advantages over current lithium-ion batteries. Finally, the costs of manufacturing batteries are declining, partly because of U.S. technical leadership. According to RMI 2019, increasing investment in the lithium-ion supply chain will reduce the cost of new manufacturing capacity (on a per-GWh basis) by more than half from 2018 to 2023.

GLOBAL RAW MATERIALS AND PROCESSING

Benchmark Mineral Intelligence (2019) estimates that more than 2,000 GWh of battery capacity will be in the pipeline for 2028. Globally, raw material reserves are more than sufficient to support the transition to EVs (Greim et al. 2020). A concern regarding domestic EV manufacturing is access to a supply of (and capacity to process) raw materials. Currently, the United States depends largely on foreign sources for most of the 35 rare-earth elements needed for manufacturing batteries, wind turbines, and other clean energy technologies. Foreign sources also supply most of the other critical raw materials for batteries and motors, including lithium, graphite, and cobalt. Most analysts expect that raw material supplies, with the possible exception of lithium, will not be a constrained during the next 10 years. Still, efforts are underway to address ongoing lithium supplies and demand, and governments are planning numerous efforts to address longer-term supply risks for other minerals and elements.[26]

25 See January 2021 "Executive Order on ensuring the future is made in all of America by all of America's workers." [last accessed 05/22/2021]

26 See BNEF, Electric Vehicle Outlook 2020. [last accessed 05/22/2021]

The United States has a start on securing reliable sources of raw materials. California's Salton Sea presents an opportunity to create a new U.S. lithium industry. Lithium is found in high concentrations in the Salton Sea brine, and several ventures currently are experimenting with extraction methods. Other projects are underway to expand or develop domestic mining and processing capacity for lithium and other raw materials.[27] In 2020 U.S. agencies established a consortium to promote a domestic battery industry, citing the role the industry could play in consumer electronics and national defense. The United States is using the Defense Production Act to speed development of mines for extracting rare-earth elements. Congress included provisions to secure domestic and allied sources of strategic minerals and metals, including lithium, in the National Defense Authorization Act for fiscal year 2021.[28] In April of 2021, the U.S. Department of Energy launched a $30 million grant program to support increasing domestic supplies of rare-earth elements.

Recycling batteries is another way to secure raw materials. Some experts suggest a significant proportion (30%-40%) of demand for raw materials for new batteries can be met through recycling.[29] Multiple systems and processes are available to recover rare-earth metals from used batteries. China is the only country that has a policy focused on recycling vehicle batteries. China's largest EV manufacturer, BYD, has begun construction of a battery recycling plant in Shanghai. Other countries are pursuing recycling. A Belgian company has developed a smelting technology to recover battery metals, including cobalt. Redwood Materials, a startup developed by a former Tesla Chief Technology Officer, is recovering scrap metal left from the manufacture of EV batteries for use in new EV batteries.

The development of robust battery recycling programs will be especially important for the United States as it approaches high-volume EV manufacturing in 2030. More can and should be done to create a large-scale battery recycling industry in the United States. America can follow China's lead and impose battery recycling obligations on EV manufacturers; require battery products to be standardized for easy disassembly; and establish tracing systems for battery components.

27 For example, the Australian firm Ioneer is seeking permits to establish a lithium mine in Nevada to quadruple U.S. production. Another company, Piedmont Lithium Ltd., expects to begin producing lithium in North Carolina by 2023.

28 See December 2020 Metal Tech News, "Strategic metals firepower for Pentagon." [last accessed 05/22/2021]

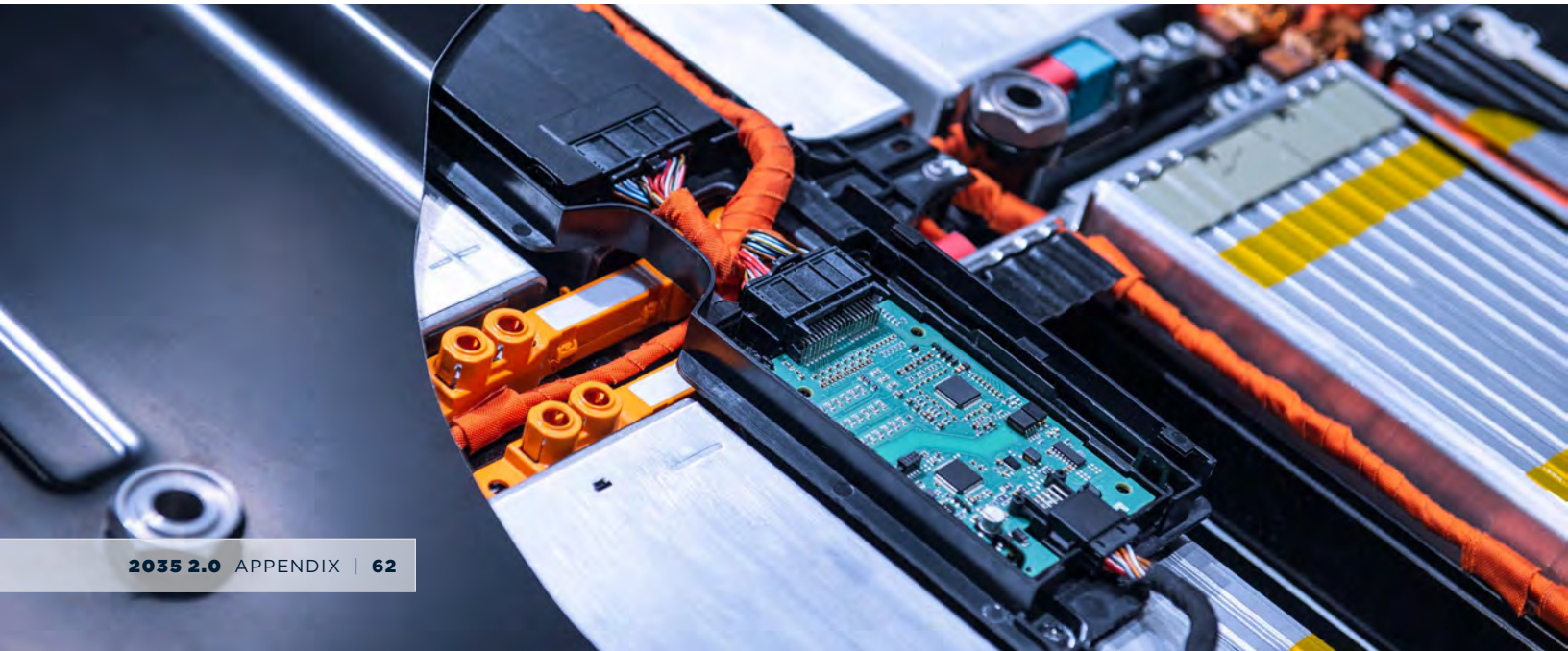
29 See Union of Concerned Scientists February 2021 fact sheet titled, "Electric vehicle batteries: Addressing questions about critical materials and recycling." [last accessed 05/22/2021]

APPENDIX 5

DISTRIBUTION SYSTEM INVESTMENTS

Although our analysis of the power sector considers the impacts of vehicle electrification on investment in new generation and transmission capacities, it does not consider impacts to distribution systems. Distribution grids will require upgrades to support increasing electric loads from vehicle charging. A supporting analysis from E3 evaluates investments in distribution systems required to support electrification (Cutter et al. 2021). This analysis considers impacts of light-duty electric vehicles only; additional work is needed to understand the impacts MDVs and HDTs, as well as other industry subsectors such as buildings, will have on the distribution system.

This analysis estimates the U.S. national electric utility distribution upgrade costs that will be driven by EV charging for the No New Policy and DRIVE Clean (100% electrification of LDV sales by 2030) scenarios in the 2035 Report 2.0. We estimate costs for two categories of upgrades: primary distribution costs such as distribution transformers and feeder lines driven by coincident peak EV charging (coincident peak load); and secondary distribution costs such as lines connecting distribution transformers to homes, driven by the interconnection of EV chargers (connected load). Key drivers of distribution upgrade costs vary widely and are location-specific, making any nationwide estimate



necessarily approximate. For the DRIVE Clean scenario we estimate 2050 annual revenue requirements for distribution upgrades that range from $2.8 to $20 billion. Even at the high end, this is a fraction of the $162 billion of annual distribution revenue requirement projected for 2050 by the 2021 Annual Energy Outlook. Additionally, the added EV charging load would actually reduce average $/kWh distribution rates. The 2021 AEO projects a national average distribution cost of $0.03397/kWh based on retail sales of 4,748 TWh in 2050. The highest cost estimates of the E3 analysis add $20 billion in annual revenue requirement for the distribution system, and a total of 882 TWh of EV charging load. This results in an average distribution rate of $0.03221/kWh, a reduction of $0.0018/kWh or 5%. Furthermore, simple managed charging solutions such as TOU rates could reduce distribution costs by 50% or more. Figure 26 details the cumulative distribution system investment costs of the DRIVE Clean scenario for the four cases E3 analyzed. The CA DRP cases are a detailed evaluation of all forecasted needs on the distribution system, based on an approach developed for the California Distribution Resource Planning Proceeding. The Marginal Cost cases are based on a survey of marginal cost approaches commonly used to estimate load growth in various rate cases and proceedings throughout the U.S. High and low estimates are utilized for each case.

The full analysis is published as a standalone paper and can be accessed here.

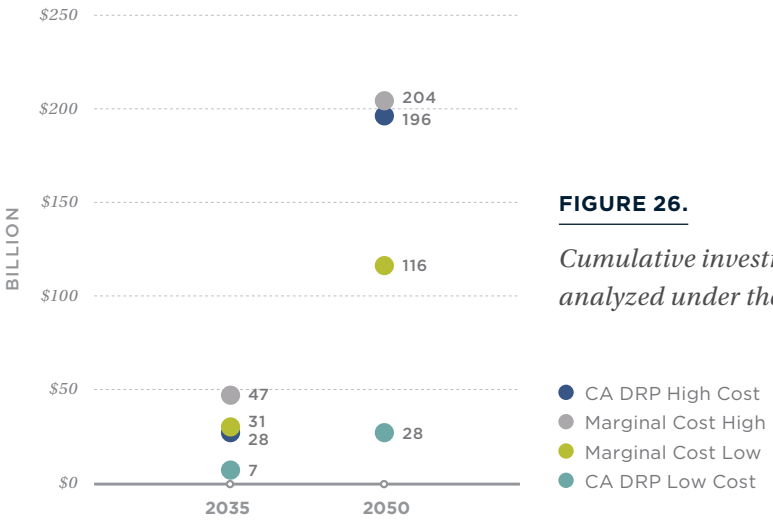


FIGURE 26.

Cumulative investment cost for four cases E3 analyzed under the DRIVE Clean Scenario

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Throughout the history of the American West, water issues have shown their ability to both unite and divide communities. As an imbalance between water supplies and demands grows in the region, KUNC is committed to covering the stories that emerge.

The Colorado River's biggest user will conserve some water in exchange for federal dollars

KUNC | By Alex Hager

Published December 5, 2023 at 9:25 AM MST

Alex Hager / KUNC

John Hawk watches farmworkers pick vegetables in California's Imperial Valley on June 20, 2023. Hawk and other farmers in Imperial Irrigation District say compensation will be an important part of saving water in the region.

The Imperial Irrigation District in California, which uses more Colorado River water than any other farm district or city in the West, has agreed to conserve 100,000 acre-feet in 2023 in exchange for payments from the federal government. It's less than half the amount of water the district originally proposed saving last spring.

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The district's conservation agreement represents the first batch of water conserved as part of Imperial's contributions to a three-state agreement in which California, Arizona and Nevada are pledging to conserve at least 3 million acre-feet of water by the end of 2026, with at least 1.5 million conserved by the end of 2024. An acre-foot is the amount of water needed to fill one acre of land to a height of one foot. One acre-foot generally provides enough water for one to two households for a year.

In April, the irrigation district said it would conserve 250,000 acre-feet each year through 2026 as part of a water-saving proposal from the Colorado River Board of California. The 100,000 acre-feet announced in this latest proposal is less than half of that initial goal, but officials with the district say they are aiming to conserve a total of 800,000 acre-feet across the four-year stretch—a goal still 200,000 acre-feet short of the original four-year proposal.

"We're not backing away from the 250k – but it is a big number," Robert Schettler, a spokesman for Imperial Irrigation District, wrote in an email. "It was felt that this was needed to be done sooner than later for this single year."

Tina Shields, Imperial's water department manager, said conserving a larger quantity of water would have required a multi-year environmental review process, which the district plans to pursue for a 2024-2026 conservation deal.

"We were able to knock out an agreement for this year to do as much as we could under existing programs," she said. "But we couldn't implement any new programs without that environmental permitting piece."

Michael Cohen, a senior researcher with the water think tank Pacific Institute, said he thinks Imperial may have been ready to offer more water in exchange for more federal payment—but the Bureau of Reclamation may be doing "some deliberation" and waiting to see if mountain snow adds to this year's Colorado River water supply before spending more money.

"We don't know how much water is coming, this coming winter," Cohen said. "I'm hopeful that Reclamation is conserving some of that money because they're going to need to invest presumably more money, maybe not for 2024, but 2025 and 2026."

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Alex Hager / KUNC

Water from the Colorado River flows through the East Highline Canal on its way to farms in the Imperial Valley on June 20, 2023. The Imperial Irrigation District recently agreed to conserve 100,000 acre-feet of water in 2023.

Reclamation, the federal agency that manages the Colorado River's major dams and reservoirs, will pay about $776 for each acre-foot Imperial conserves, Shields said. That's nearly double the amount it has paid out to other agricultural districts for water conservation. Federal payments have mostly been capped at $400 per acre-foot, including some made to farm districts that neighbor Imperial. The actual price will be adjusted slightly to account for inflation before payments are finalized.

Some Southwestern farmers have suggested they want much higher payments, sometimes more than $1,200 per acre-foot, since the Biden Administration announced last year it would spend billions on drought mitigation work in the Colorado River basin.

The payout value is tied to a contract between Imperial Irrigation District and the San Diego County Water Authority. About half of the water that will be conserved was initially designated to be transferred to San Diego, but will now instead remain in Lake Mead, the nation's largest reservoir. Imperial officials said the saved water comes from efficiency programs on farms within the district, like new sprinklers and pumps as well as other innovative changes to the fields in which crops are grown.

Farmers in the Imperial Valley told KUNC last summer that federal payments are an integral part of spurring them to help cut back water use.

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Those farmers and Imperial Irrigation District officials also stressed the need for money to help remedy problems caused by a drying Salton Sea. The Colorado River used to intermittently fill the giant lake before it was dammed upstream, causing its flows to be significantly curtailed.

Now, with the river confined to its channel, the sea is sustained with runoff from the farm fields of the Imperial Valley. As the valley's farmers use less water, the Salton Sea will continue to dry up, reducing habitat for the flocks of migratory birds that stop there and producing dust storms that increase the risk of asthma and other respiratory diseases among the valley's residents.

This week's water conservation agreement triggers the release of $70 million from an available $250 million in federal funding earmarked last year for environmental projects to support the Salton Sea. Bureau of Reclamation officials, including commissioner Camille Calimlim Touton, plan to visit the Salton Sea later this week to highlight that spending.

This story is part of ongoing coverage of the Colorado River, produced by KUNC and supported by the Walton Family Foundation.

Tags News | Topic: Western Water Coverage | California | Colorado River | Colorado River Basin | Water

Alex Hager

Alex is KUNC's reporter covering the Colorado River Basin. He spent two years at Aspen Public Radio, mainly reporting on the resort economy, the environment and the COVID-19 pandemic. Before that, he covered the world's largest sockeye salmon fishery for KDLG in Dillingham, Alaska.

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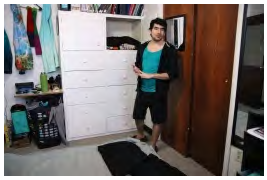

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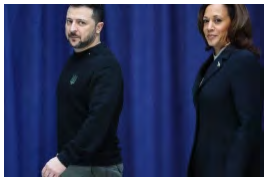

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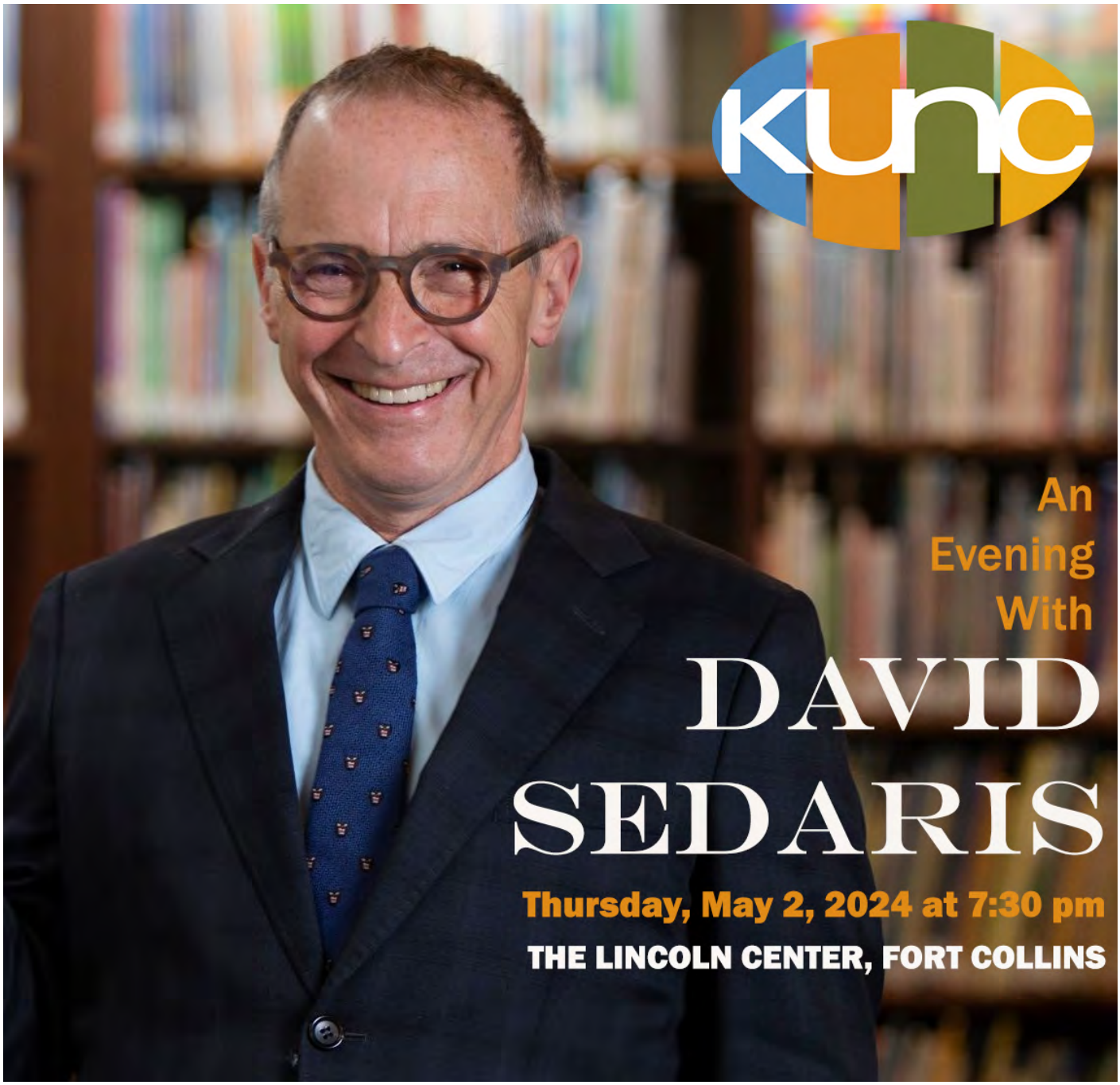

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Alex Hager, July 6, 2023

JB Hamby represents the state of California in Colorado River negotiations. The 27 year-old is leaning on history and his Imperial Valley upbringing for guidance.

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Freeing up Colorado River water from California farms will take more than just money, just ask the farmers

Alex Hager, July 17, 2023

Farmers in California's Imperial Valley have the single largest water allocation along the Colorado River. They say they need to be compensated before taking cutbacks.

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Customers are reminded that they must continue to receive bottled or bulk water delivery service on a year-round basis in order to maintain their canal water connection. Water users who fail to do so will be disconnected from IID's canal water system.

www.iid.com

In accordance with the Safe Drinking Water Act, IID's untreated canal water should not be used for drinking and cooking purposes. Customers who have canal water service to their homes (small acreage pipe accounts) must provide documentation that their water needs for drinking and cooking purposes are being served by an approved water provider that delivers an alternative water supply suitable for these purposes.

State law does not mandate alternate water sources for purposes other than drinking and cooking; however, the United States Environmental Protection Agency and State Water Resources Control Board advises against the use of untreated canal water for common domestic uses including oral hygiene, ice preparation, irrigating/cleaning wounds, or food preparation like washing fruits and vegetables or meat products.

Using untreated canal water for these purposes can cause disease if pathogens are present in the water. Adverse effects are typically more severe in infants, the elderly, and those with compromised immune systems and life threatening illnesses.

To reduce your risk, you should:

- Use an alternate water source for oral hygiene, ice preparation, irrigating or cleaning wounds, and when washing any food that will not be subsequently cooked;
- Avoid getting any untreated canal water in your mouth when bathing or showering; and
- Rinse dishes in the hottest water you can manage and do not use until they have been completely dried, either by the air or a clean towel.

The quality of the untreated canal water has not changed, and while IID has not had any reports of illness due to pathogens in our canals, the health and welfare of our customers is paramount so we remind customers to be safe.

WATER DELIVERY ASSISTANCE PROGRAM

Did you know that IID offers financial assistance to help with delivery costs of drinking water to qualifying small acreage pipe customers?

Under IID's Water Delivery Assistance Program, the district will help pay for the monthly costs of water delivery services to a customer's home.

In order to take advantage of this program, you must also be enrolled in IID's Residential Energy Assistance Program, which provides qualified customers a discount on their electric bill. The income qualifications for both programs are as follows:

No. in Household	Max Annual Household Income
1-2	$39,440
3	$49,720
4	$60,000
5	$70,280
Each add'l. person	$10,280

To apply, please call us at **1-760-339-9191**, or visit us online at **www.iid.com/waterdelivery**.

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Brawley
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1-800-492-8377

Se les recuerda a los clientes que deben continuar recibiendo el servicio de entrega de agua embotellada o en mayoreo durante todo el año a fin de mantener su conexión de agua del canal. Los usuarios de agua que no cumplan serán desconectados del sistema de agua del canal de IID.

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PROGRAMA DE CUMPLIMIENTO DE AGUA POTABLE

De acuerdo con la Ley de Agua Potable Segura, el agua de canal sin tratamiento de IID no debe utilizarse para beber ni cocinar. Los clientes que reciben en su casa agua de canal (cuentas de tuberías de pequeñas superficies) deben proporcionar documentación de que sus necesidades de agua para beber y cocinar están siendo atendidas por un proveedor de agua aprobado que ofrece una fuente de agua alternativa adecuada para estos propósitos.

La ley estatal no exige fuentes alternativas de agua para otros fines que no sean el consumo y la cocina; sin embargo, la Agencia de Protección Ambiental de los Estados Unidos y la Junta de Control de Recursos Hídricos del Estado advierten contra el uso de agua de canal no tratada para usos domésticos comunes incluyendo higiene oral, preparación de hielo, irrigación/limpieza de heridas o preparación de alimentos como lavar frutas y verduras o carnes.

El uso de agua de canal no tratada para estos fines puede causar enfermedades si hay patógenos presentes en el agua. Los efectos adversos suelen ser más graves en los lactantes, los ancianos y aquellos con sistemas inmunológicos comprometidos y enfermedades potencialmente mortales.

Para reducir su riesgo, usted debe:

- Utilizar una fuente de agua alternativa para higiene oral, preparación de hielo, irrigación o limpieza de heridas, y al lavar cualquier alimento que no se cocine posteriormente;
- Evitar tomar agua de canal no tratada al bañarse o ducharse; y
- Enjuagar los platos con el agua más caliente que pueda tolerar y no usarlos hasta que estén completamente secos, ya sea con aire o una toalla limpia.

La calidad del agua cruda del canal no ha cambiado, y aun cuando IID no tenga ningún reporte de enfermedades debido a los patógenos en nuestros canales, la salud y el bienestar de nuestros clientes es primordial por lo que le recordamos esto a los cliente para que esté seguro.

PROGRAMA DE ASISTENCIA PARA ENTREGA DE AGUA

¿Sabía usted que IID ofrece asistencia financiera para ayudar con los costos de entrega de agua potable a los clientes de tuberías de pequeña superficie que califican?

Bajo el Programa de Asistencia para Entrega de Agua de IID, el distrito ayudará a pagar los costos mensuales de servicio de entrega de agua a la casa del cliente.

Para poder aprovechar este programa, también debe estar inscrito en el Programa de Asistencia de Energía Residencial del IID, que proporciona a los clientes que califican un descuento en su factura de electricidad. Los requisitos de ingresos para ambos programas son los siguientes:

No. de Integrantes	Máximo Ingreso Familiar Anual
1-2	$39,440
3	$49,720
4	$60,000
5	$70,280
Cada persona adic.	$10,280

Para solicitarlo, llámenos al **1-760-339-9191** o visítenos en línea en **www.iid.com/waterdelivery**.

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01162024

News & Resources

IID Backs Conservation Plan, Strengthening Colorado River and Salton Sea

The Imperial Irrigation District Board of Directors have unanimously approved the 2023 System Conservation Implementation Agreement with the U.S. Bureau of Reclamation, signaling IID's commitment to the sustainability of the Colorado River and Salton Sea.

Post Date: 12/01/2023

EL CENTRO, CA – As part of the historic Lower Basin Plan between Arizona, California, and Nevada to conserve 3 million acre-feet of water by 2026 to protect the Colorado River system from extended drought, the Imperial Irrigation District (IID) Board of Directors met today, unanimously approving the 2023 System Conservation Implementation Agreement (SCIA) with the U.S. Bureau of Reclamation. This landmark agreement signals IID's commitment to the sustainability of the Colorado River, crucial to the Imperial Valley as its sole source of water.

The agreement also triggers the release of $70 million from an available $250 million in federal funding earmarked last year for environmental projects to support the Salton Sea.

Under the SCIA, IID pledges to conserve up to 100,000 acre-feet of water in 2023, raising Lake Mead's elevation behind Hoover Dam by 1.5 feet. This responsive action is a component of the broader May 2023 Lower Basin Plan, which Reclamation identified as the proposed action for near-term operations of the river resulting from the June 2022 call to action by Reclamation for Colorado River water users to develop near-term plans to reduce consumptive use and safeguard critical reservoir elevations.

"This proactive step to support the river is vital for our community. I want to thank and congratulate all parties involved for their collaborative efforts, which have resulted in this agreement that benefits the Colorado River, Lake Mead, and the Salton Sea," stated IID Board President Alex Cardenas.

The conserved water, generated entirely through IID's On-Farm Efficiency Conservation Program, exemplifies the outstanding efforts of Imperial Valley growers. About half of the conservation, 50,000 acre-feet, initially designated for transfer to the San Diego County Water Authority (SDCWA) will now instead remain in Lake Mead as a result of an innovative three-party agreement between IID, SDCWA, and The Metropolitan Water District of Southern California, benefiting the entire basin through collaborative partnerships and funded at current rates through the Inflation Reduction Act.

IID, holding some of the most senior and legally protected water rights on the Colorado River, annually conserves approximately 500,000 acre-feet of water under the Quantification Settlement Agreement (QSA), the nation's largest ag-to-urban water conservation and transfer pact.

JB Hamby, IID Director and Chairman of the Colorado River Board of California, emphasized the significance of IID's commitment, stating, "IID's action today demonstrates leadership on the Colorado River that will protect the Imperial Valley, California, and the Colorado River Basin as a whole from record drought in the near-term and clear the way for focused discussions on operating the Colorado River sustainably in the long-term."

Coordination for conservation efforts beyond 2023 continues, with IID proposing a cumulative target of 800,000 acre-feet of additional conservation by 2026. The district has initiated an environmental compliance process for 2024-2026 conservation efforts and is working with agricultural stakeholders and Reclamation to finalize new conservation programs to generate this volume.

The IID's commitment extends beyond water conservation, with a focus on supporting the Salton Sea as its leading advocate. Collaborative efforts, as outlined in the historic agreement between Reclamation, the California Natural Resources Agency, Coachella Valley Water District, and IID in December 2022, designated $250 million in funding from the Inflation Reduction Act for state projects contributing to the Salton Sea's restoration.

Wade Crowfoot, Secretary, California Natural Resources Agency:

"A year ago this month, the Colorado River system was facing near-term collapse. Today, the system is stabilized for coming years thanks to IID and other water agencies across California and the Southwest stepping up to conserve water. These were not easy decisions, and leadership from the U.S. Bureau of Reclamation and funding provided by the President and Congress has been pivotal to these emergency actions. Now, as these near-term conservation programs stabilize Lake Mead and the whole Colorado River system, water agencies across the region are working together to chart a sustainable future for the Basin. We can be proud of our collective progress in recent months while we recognize there is much important work ahead."

Dan Denham, General Manager, San Diego County Water Authority:

“The San Diego County Water Authority is pleased to partner with the Imperial Irrigation District, Metropolitan Water District and the U.S. Bureau of Reclamation on a mutually beneficial exchange agreement that will help bolster the river for all users. It is this kind of flexibility and consensus planning that will pave the way for a more sustainable river, and it is another example of the leadership California water agencies have shown over the past 20 years since the signing of the QSA.”

Adán Ortega, Jr., Chair, Metropolitan Water District Board of Directors:

“This partnership between Metropolitan, Imperial Irrigation District, San Diego County Water Authority and the Bureau of Reclamation is one example of how solutions developed collaboratively can benefit everyone. Our individual efforts to reduce our reliance on the Colorado River can be magnified by our growing and mutual interdependence leading to creative and lasting solutions, where the people we all serve win, as does the environment.”

# # #

About IID and Farming in Imperial Valley:

- IID has conserved over 7.7 million acre-feet of water since 2003, with 1.5 million generated through the On-Farm Efficiency Conservation Program since 2013.
- Imperial Valley farmers and IID continue to ramp up water conservation efforts annually, utilizing advanced irrigation technologies and sustainable farming practices, including the installation and use of sprinklers, drip systems, field reconfiguration and precision land-leveling, tailwater return systems, and other field-level conservation measures.
- Imperial Valley remains one of California's and the Colorado River Basin’s top agricultural producers, with one in every six jobs directly related to agriculture, the backbone of the local economy.

Return to full list >>

March 23, 2021

Mr. Sean Sterchi, PE
San Diego/Imperial District Engineer
State Water Resources Control Board
Division of Drinking Water – San Diego
1350 Front Street, Room 2050
San Diego, CA 92101

Subject: 2020 Annual Report-SDWA Compliance Project

Dear Mr. Sterchi:

On May 16, 2000, the California Department of Health Services, now the Division of Drinking Water, issued a departmental determination that the Imperial Irrigation District had fulfilled the requirements of its Compliance Agreement to implement the exclusions outlined in Section 116275(s) of the California Safe Drinking Water Act. Through the methodologies, procedures, and processes established by the Compliance Agreement, IID's non-agricultural water users have been "excluded" on a case-by-case basis as domestic water connections and, therefore, IID is not required to submit an application for a Public Water Supply permit. In accordance with this determination, please accept this letter as IID's annual report (covering the 2020 calendar year) outlining its ongoing SDWA compliance efforts.

In 2020, the vast majority (84.0 percent) of IID's 3,208 canal water users were excluded based on the "alternative water" designation. The remaining canal water users either received treated water from a local municipality or small public water system (6.0 percent), or did not use the canal water for "residential purposes" (3.0 percent). Some portions of our accounts were also classified as idle/vacant (6.5 percent). Once again, IID was not forced to terminate any canal water connections last year in order to maintain compliance, nor did we issue any disconnection notices. On no occasion in 2020 did IID have 15 or more canal water connections that failed to have an alternative water source for drinking and cooking purposes.

Last year four DDW Approved Providers (D&M Water Company, El Oasis Water Company, Roman's Water, and Sparkletts Waters) continued to provide alternative water delivery service to IID customers. The IID Board of Directors continued to provide funding for the Alternative Water Delivery Assistance Program to prevent the termination of alternative water delivery service to low-income water users who meet the IID Energy Department's Residential Energy Assistance Program criteria. IID staff continues to work with the Imperial County Planning & Development Services Department to ensure that new rural construction projects are not permitted until both agencies' water requirements are fulfilled and that all major subdivisions are connected to an adequate potable water supply.

Account information and owner records are regularly updated as new information becomes available and/or as tenant changes occur. Additionally, the ability to access data from IID's power records at each service pipe location supports our capacity to monitor these tenant changes and ensure compliance with SDWA requirements. Physical site visits continue to play a critical role in IID's routine SDWA compliance and enforcement activities along with the annual DDW Approved Provider verification process. To facilitate these efforts, IID continued to dedicate a field staff position to assist current office and database personnel in these rural site visits.

A new pilot program to support SDWA efforts was initiated in 2018. IID and Imperial County have collaborated to identify opportunities focused on rural water quality issues, particularly for low-income customers, to develop new mechanisms to address these complicated issues. A $400,000 pilot project has been implemented that will fund the purchase, installation and monitoring of point-of-entry treatment devices for certain low income customers enrolled in the Alternative Water Delivery Assistance Program. To date, 15 systems have been completed and are operational, while several more systems are scheduled for installation.

As a follow-up to the recommendations that were listed in your November 5, 2018 letter to the IID regarding an evaluation of potential backflow from private chemical applications into the IID conveyance system, IID would be pleased to initiate this effort. We believe a tour of the district's water service area would be helpful, and perhaps we could facilitate a conversation with the Imperial County Agricultural Commissioner's office and local growers, so that your staff can more fully understand the Water Department's operations, routine agricultural delivery conditions and pesticide use requirements. That would then allow for a more productive conversation regarding the need for, and identification of, any additional feasible safety measures. The COVID-19 pandemic has clearly limited travel for all parties, but once conditions allow, please let us know when you and your staff are available and we will gladly organize a kick-off meeting.

As always, IID appreciates the cooperation of your agency and staff as we continue to ensure IID canal water users are compliant with both federal and state SDWA. We look forward to working with your office and other partners to develop long-term strategies aimed at reducing rural dependence on IID's canal water system. If you have any questions, please feel free to contact me directly at (760) 339-9143.

Sincerely,

Steve Charlton

Steve Charlton
Senior Program Manager, Water Quality Programs

cc: Board of Directors/GM/Legal
Tina Shields, Manager, Water Department
Carrie Cruz, Water Operations Analyst I

Imperial Irrigation District
Safe Drinking Water Annual Report for 2020

Section	Description	Excl	Count
1	EXCLUDED CONNECTIONS (per SDWA Definitions)		
	Non-Domestic User Exclusion		
	Irrigation, stockwater, etc.(no indoor use)	1	90
	Private Well	3A	7
			97
	Alternative Treatment Exclusion		
	Large Public Water System (municipal/private PWS)	3	169
	Large Public Water System (<200 connections)	3	24
			193
	Alternate Water Supply Exclusion		
	Approved Provider (verified)	2	2,514
	Approved Provider (financial assistance)	2A	180
			2,694
	Alternate Water Supply - non-approved source	4	0
			0
	Idle/Vacant Accounts (no indoor use)		
	Vacant	7	205
	Vacant (No Meter)	7A	5
			210
	New Accounts (Verification in progress)	5	14
			14
	Water User Association	6	0
			0
	Section Total		**3,208**
2	CONNECTIONS (per SDWA definitions)		
	No Alternative Water (indoor use of canal water)	9	
	POE, No Alternative Water (point of entry system)	9	
	No Response (not verified)	9	
	Section Total		
3	New Construction Total		0
	Number of days exceeding SDWA compliance requirements		
	(15 or more connections per SDWA definitions) in 2016		0
			0
	Section Total		**0**
	Grand Total		**3,208**

Municipal, Industrial and Commercial Customers

Last updated February 1, 2023

IID provides raw (untreated) Colorado River water to municipal, industrial and commercial customers. For a complete description of IID's Water Rules and Regulations, please refer to Regulation No. 3 Application for Service.

Industrial water users may be required to sign a contract, which specifically limits the amount of water discharged into IID drains, and maintain a water metering device. The contract may also specify the water holding facilities required for the industry.

New Water Supply Agreements

In September 2009 the IID Board of Directors adopted an Interim Water Supply Policy for Non-Agricultural Projects (IWSP) to provide a mechanism to address new water supply requests for proposed projects being developed within the IID service area. The IWSP designates up to 25,000 acre-feet of IID's annual Colorado River water supply for any new projects, provides a mechanism and process to develop a water supply agreement for any appropriately permitted project, and establishes the framework and set of fees necessary to ensure the supplies used to meet any new demands do not adversely affect existing users by funding water conservation or augmentation projects.

Depending on the nature, complexity and water demands of the proposed project, new projects may be charged a one-time Reservation Fee and an annual Water Supply Development Fee (see chart) for the contracted water volume used solely to assist in funding new water supply projects. All new industrial use projects shall be subject to the fee, while new municipal and mixed-use projects shall be subject to the fee if the projects' water demands exceed certain District-wide average per capita use standards. The applicability of the fee to mixed-use projects will be determined by IID on a case-by-case basis, depending on the proportion of types of land uses and the water demand proposed for each project. Additionally, new projects will be charged the appropriate water rate (see Water Rate Schedules) based on actual water use.

INTERIM WATER SUPPLY POLICY **2024 ANNUAL NON-AGRICULTURAL WATER SUPPLY DEVELOPMENT FEE**		
Annual Demand (AF)	Reservation Fee ($/AF)*	Development Fee ($/AF)*
0-500	$88.77	$355.07

501-1000	$124.98	$499.94
1001-2500	$156.94	$627.76
2501-5000	$193.87	$775.47

*To be adjusted annually after 2010 in accordance with the Consumer Price Index (CPI).

To date, IID has issued two Water Supply Agreements under the IWSP totaling 5,380 acre-feet per year, leaving a balance of 19,620 acre-feet per year of supply available for contracting under the IWSP.

For new, non-agricultural water supply, please read available information posted below. New project contacts in need of more detailed information from IID regarding the IWSP or water supply availability can be directed to Justina Gamboa-Arce at (760) 339-9085.

For temporary projects, including construction activities, please complete the Application for Temporary Water Use and submit it with an Encroachment Permit Application to the Real Estate Section.

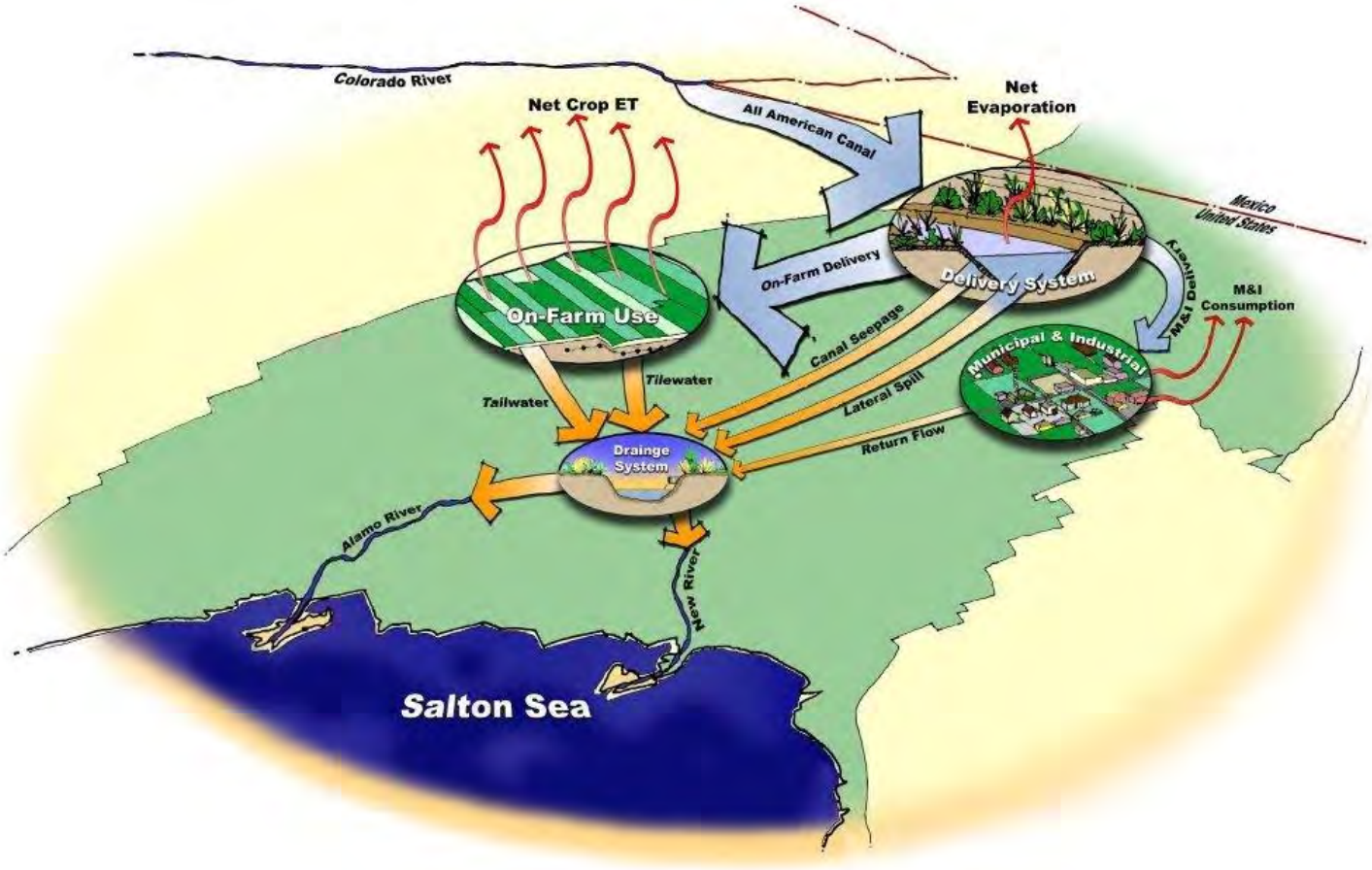
DOWNLOAD
Temporary Land Conversion Fallowing Policy [PDF] *Adopted 5/8/2012 (Revised 3/29/2016)*
IID Interim Water Supply Policy (IWSP adopted 9-29-09 with 2024 revised fee schedule) [PDF]
IID Water Supply Assessment/Water Supply Verification Consultation Process [PDF]
IID-410 Certificate of Ownership and Authorization May 2011 [PDF]

Water Transportation System

IID is entitled to 3.1 million acre-feet each year from the Colorado River. Imperial Dam, located north of Yuma, Arizona, serves as a diversion structure for water deliveries throughout southeastern California, Arizona and Mexico. The operations of IID's River Division Office at Imperial Dam, as well as system wide water distribution, all fall under the direction of the United States Bureau of Reclamation. Water diverted at Imperial Dam for use in the Imperial Valley first passes through one of three desilting basins, used to remove silt and clarify the water. Each desilting basin is 540 feet wide by 770 feet long and is equipped with 72 scrapers designed to remove 70,000 tons of silt per day. The silt is returned to the river by means of six sludge return pipes that deposit the silt into the California Sluiceway. From the desilting basins, water is then delivered to the Imperial Valley through the All-American Canal.

Three main canals, East Highline, Central Main and Westside Main, receive water from the 80-mile long All-American Canal and distribute water to smaller lateral canals throughout the Imperial Valley. Farmers receive water in private ditches from the lateral canals to irrigate nearly 500,000 acres of farmland within IID's water service boundaries. Another important component of IID's distribution system are the seven regulating reservoirs and four interceptor reservoirs that have a total storage capacity of more than 4,300 acre-feet of water.

IID serves water through approximately 5,600 delivery gates for irrigation purposes. It operates and maintains more than 1,400 miles of lateral canals, 150 miles of main canals and the 80-mile-long All-American Canal. IID also maintains over 1,450 miles of drainage ditches used to collect surface runoff and subsurface drainage from over 32,000 miles of tile drains underlying nearly 500,000 acres of farmland. Most of these drainage ditches ultimately discharge water into either the Alamo River or New River.


Colorado River
Net Crop ET
All American Canal
Net Evaporation
Mexico
United States
On-Farm Delivery
Delivery System
M&I Delivery
M&I Consumption
On-Farm Use
Canal Seepage
Municipal & Industrial
Tilewater
Tailwater
Lateral Spill
Return Flow
Drainge System
Alamo River
New River
Salton Sea

Earthjustice

Batch 4 of Attachments to Scoping Comments on Proposed Lithium Valley Specific Plan and Program Environmental Impact Report

Feb. 20, 2024

Modelling of hydrogen production from hydrogen sulfide in geothermal power plants

Article *in* International Journal of Hydrogen Energy · March 2018

DOI: 10.1016/j.ijhydene.2018.02.020

2 authors:

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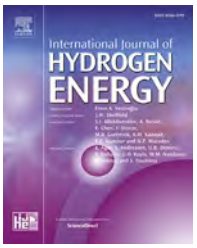

Modelling of hydrogen production from hydrogen sulfide in geothermal power plants

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ABSTRACT

Geothermal power plants emit high amount of hydrogen sulfide (H_2S). The presence of H_2S in the air, water, soils and vegetation is one of the main environmental concerns for geothermal fields. There is an increasing interest in developing suitable methods and technologies to produce hydrogen from H_2S as promising alternative solution for energy requirements. In the present study, the AMIS technology is the invention of a proprietary technology (AMIS® - acronym for "Abatement of Mercury and Hydrogen Sulfide" in Italian language) for the abatement of hydrogen sulphide and mercury emission, is primarily employed to produce hydrogen from H_2S. A proton exchange membrane (PEM) electrolyzer operates at 150 °C with gaseous H_2S sulfur dimer in the anode compartment and hydrogen gas in the cathode compartment. Thermodynamic calculations of electrolysis process are made and parametric studies are undertaken by changing several parameters of the process. Also, energy and exergy efficiencies of the process are calculated as % 27.8 and % 57.1 at 150 °C inlet temperature of H_2S, respectively.

Introduction

One of the most important enviromental issues related to the geothermal operating fluids to generate electricity is non-condensable gases emission. Vent stacks in geothermal plants emit carbon dioxide (CO_2) and methane (CH_4) gases which consequently raise serious concerns in terms of greenhouse gases. The amount of these emissions are quite small compared to carbon and fossil fuel plants, which indicates that the contribution of these sources is practically negligible. Geothermal power plants also emit higher amount of hydrogen sulfide (H_2S) due to the employment of H_2S as a main constituent of the geothermal fluids. The presence of H_2S in the air, water, soils and vegetation is one of the main enviromental concerns [1].

Hydrogen sulfide is a colorless water-soluble gas, smelling as rotten eggs and is known for this putrid gas. Its origin may be natural (about 90% of the total H_2S in the atmosphere given by EPA, [2]) as gas species produced by anaerobic bacterial reduction of sulfur-containing animals and vegetable proteins and as gas released from volcanoes and geothermal areas. The artificial origin of hydrogen sulfide derives from the production process of coking coal, cellulose, fertilizers, dyes and pigments, refinement of crude petroleum, tanning of hides and waste water treatment.

Background concentrations of H_2S in unpolluted ambient air have been estimated to be between 0.14 and 0.4 μg/m^3 [2],

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whilst the typical concentration in urban area is about one order of magnitude higher (1.0–3.0 μg/m^3 [3]). The high air levels of H_2S are measured near waste-water treatment plants, oil refineries, and land-fills (from a few units to a few tens of mg/m^3 [4], as well as in volcanic and geothermal areas, where H_2S is likely formed by water-rock interaction, which is accelerated by the high heat gradient induced by the presence of a cooling magma body. In these situations, the H_2S is released in the atmosphere by hot vents and hot springs.

H_2S is normally in gas phase and can be absorbed in lungs through inhalation. Health effects include respiratory, ocular, neurological, and metabolic effects and the death after single exposures to concentrations higher than 700 mg/m^3 [4]. A summary of these effects is presented in Table 1.

Due to resources depletion and non-sustainable resources, fossil fuels are not capable of compensating the growing energy needs. In addition, the easily extractable fossil fuels are facing an increase in their prices. It is worth mentioning that greenhouse gases (mainly CO_2) have been accumulated in the atmosphere by burning fossil fuels. Therefore, clean and sustainable energy has become much more important and researches have been intensified to make it more affordable and productive.

High efficient, environmentally benign, more feasible and societal are among the main advantages of clean energy systems. In order to achieve afore-mentioned goals, the following criteria should be met by a clean energy system: (i) zero or ignorable undesirable environmental or societal influence; (ii) ignorable or zero natural source exhaustion; (iii) capability to provide the current and forthcoming population's energy needs; (iv) trustworthy, cheap and effective fashion; (v) air, land, and water safety; (vi) insignificant or zero net Greenhouse Gas (GHG) emissions; and (vii) ignorable burden to prospect generations [5].

It can be seen that hydrogen has number of advantages such as higher energy exchange efficiency, possessing no emission while it is produced from water and employed energy is renewable based. Furthermore, it has capability to be stored in various ways and inherently is an ample energy carrier and easy to be transferred with least loss [6]. An amount of 120.7 MJ (LHV) energy can be obtained from 1 kg hydrogen which is equal to 2.1 kg natural gas, 2.8 kg gasoline and 3.1 kg fuel oil as illustrated in Fig. 1.

Considering these advantages, the current research is mainly dealing with hydrogen energy systems in order to produce hydrogen in a more affordable, reliable and efficient way with minimum environmental impacts. Determining the most suitable hydrogen generation method depends on various number of system characteristics, such as feasibility, technical aspects, resource accessibility, geographic position, climate features, affordability and reliability play an important role to detect the most beneficial hydrogen generation technique.

Electrolysis technology is considered as an effective and practical method to produce hydrogen via electrochemical reactions. Different electrolyzer types for hydrogen production include alkaline electrolyzer (AEL), polymer electrolyte membrane electrolyzer (PEMEL), and high temperature electrolzyer (HTEL). Alkaline electrolysis is more accepted technology in industrial technology and large scale units as a prevalent technology. Employing cheap materials, high durability due to the employment of robust cell separators, and more corrosion resistivity of stainless steel in 30% KOH can be considered as the main advantages of this technology. At the same time, there are specific drawbacks for alkaline systems including difficulty in handling of sodium or potassium hydroxide electrolyte, hard to reach high-pressure hydrogen production in case the storage tank size puts known limitations and limited operating temperature for the systems (80 °C) in order to support moderate current density. In contrast, recent acid PEMEL systems owe specific technical advantages compared to alkaline systems, especially once integrated with renewable energies. In comparison to alkaline systems, PEM systems show better efficiency and higher production rates. Through applying a static vapor feed configuration, PEM systems can also be further simplified which in turn, leads to further decrease in operation costs and equipment footprint. Response time in start-up and shutdown of PEM systems are almost ignorable and larger loads can be handled by this technology without problem. Up to 350 bar high-pressure operational condition can be achieved. This is

Table 1 – Human health effects resulting from exposure to H_2S [4].

Exposure (mg/m^3)	Effect/Observation
0.011	Odor threshold
2.8	Bronchial constriction in asthmatic individuals
5.0	Increased eye complaints
7.0–14.0	Increased blood lactate concentration, decreased oxygen uptake
5.0–29.0	Eye irritation
>140	Oldfactory paralysis
>560	Respiratory distress
≥700	Death

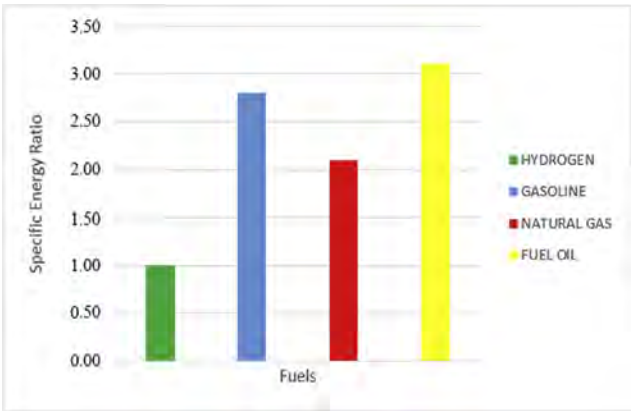

Fig. 1 – Quantities required to obtain energy from fossil fuels that can be obtained from one kilogram of hydrogen (data from Ref. [7]).

Please cite this article in press as: Karapekmez A, Dincer I, Modelling of hydrogen production from hydrogen sulfide in geothermal power plants, International Journal of Hydrogen Energy (2018), https://doi.org/10.1016/j.ijhydene.2018.02.020

specifically important when tank storage is required in limited volumes. The corresponding pressure for the alkaline systems is around 30 bar (for further details, see Ref. [8]).

Employing geothermal energy to produce hydrogen and thereby to decrease the related emission by geothermal systems have initiated a rising interest among researchers [9–12]. More recent studies deal with hydrogen generation methods. Ouali et al. [9] remarked hydrogen as a worthwhile energy resource. This study was mainly on hydrogen extraction from hydrogen sulfide in geothermal fields. Therefore, the availability of hydrogen sulfide in geothermal fields provides an opportunity to produce hydrogen more economically. This study deals with various aspects of hydrogen production in Algeria's geothermal resources from hydrogen sulfide.

Geothermal-based hydrogen production systems have been discusses elsewhere [10] with related technologies and their feasibility have been studied. Geothermal energy is used for an electrolysis process in a high-temperature process. A thermodynamic analysis was conducted for performance evaluation of this system and as a result they have calculated the energy and exergy efficiencies for hydrogen production to be 87% and 86% respectively.

An integrated system where the aim is to reduce the greenhouse gas emissions has been conducted by Al-Zaharania et al. [11]. Their system consists of three outputs. A medium-to-high temperature geothermal resource has been employed in their system. Outputs of the system are hydrogen as well as heating requirements. Parametric studies are conducted by changing specific system parameters such as source temperature, ambient and cooling water temperatures. It is shown that how energy and exergy efficiencies are changing based on these parameters. According to the study, exergy efficiency increases slightly by increasing the geothermal source temperature. On the other hand, exergy efficiency decreases through the reducing of the cooling water temperature.

In the present study, a PEM electrolyzer system is integrated with an AMIS technology (for abatement of mercury and hydrogen sulfide) and the new system is analysed. The underlying motivation of this work is not only to reduce the hydrogen sulfide emission but also to produce hydrogen from hydrogen sulfide in geothermal power plants. A PEM electrolyzer is added to a standard geothermal power plant equipped with AMIS abatement system. In addition, energy and exergy efficiencies, required electrical work, entropy generations and exergy destructions of the electrolysis process are calculated in different operational conditions.

System description

This study focuses on the hydrogen production from hydrogen sulfide in a geothermal power plant through electrolysis method. A geothermal power plant equipped with AMIS abatement system has been modified through adding a PEM electrolyzer as illustrated in Fig. 2. Here, a geothermal power plant uses hot pressurized fluid to generate the electricity energy. The geothermal fluid is basically composed by dry stream or, more frequently by hot water and steam but always with a significant amount of gases and other compounds, notably CO_2, H_2S, CH_4, NH_3, and Hg. The geothermal fluid may spontaneously reach the surface or, often, it remains confined within the reservoir because of the impervious covering. In such a case, the fluid can be extracted by means of wells (drilled to a depth of some kilometers). A single power plant can be fed by several geothermal wells. Hot and pressurized geothermal fluid is transferred to the turbine (Fig. 2), where it rapidly expands and rotates turbine blades. Rotational energy from the turbine is converted to electrical energy through an alternator. Turbine and alternator represent the basic unit of the plant whose power defines the nominal power of the plant. The steam is then discharged from the turbine to the condenser (Fig. 2) at a sub-atmospheric pressure (typically 0.08 bar). Inside the condenser, the water coming from the cooling tower is sprayed directly into the steam to enhance its condensation. Then, the mixture of cooling water and condensate is pumped to the head of the cooling tower to extract the waste heat through an upward stream of cold air which actually becomes enriched in the gases of the natural fluid. An extractor removes the non-condensable gases from the condenser and discharging to the atmosphere. The components of the power plant from which H_2S (and other gases) are discharged to the atmosphere are the cooling tower and the extractor of non-condensable gas which will make the total H_2S emission from the power plant [1].

The AMIS technology (for abatement of mercury and hydrogen sulfide) is an efficient, safe and enviromentally friendly technology capable to eliminate the related issues of the gaseous emissions from geothermal power plants and in particular the unpleasant smell of hydrogen sulfide. Geothermal fluid extracted from the reservoir by production wells is sent to the power plants by a steel pipe network. The fluid mainly consists of steam with some percentage (from less than 1% up to 15%) of non-condensable gases (NCG). Instead of being released to the atmosphere, NCG can be sent to the AMIS system for mercury and hydrogen sulfide abatement. This system consists of three fundamental steps:

- Removal of mercury by chemical absorption.
- Selective catalytic oxidation of hydrogen sulfide to SO_2.
- SO_2 scrubbing by geothermal water [12].

It worth mentioning that the AMIS system has been modified for hydrogen production from hydrogen sulfide in the current study. Hydrogen sulfide, which is obtained by extracting from gaseous emissions in an AMIS system, is separated to the pure hydrogen and gaseous sulfur dimer through the electrolysis (Fig. 3).

The overall reaction of electrolysis of hydrogen sulfide is shown in Equation (1)

$$H_2S(g) + \text{Electricity} \rightarrow H_2(g) + 1/2\ S_2(g) \quad (1)$$

H_2S gas enters at 150 °C to the electrolysis system and splits to pure hydrogen and gaseous sulfur dimer through electrochemical method. A PEM electrolyzer is operated in which a solid proton conducting membrane separates an anode

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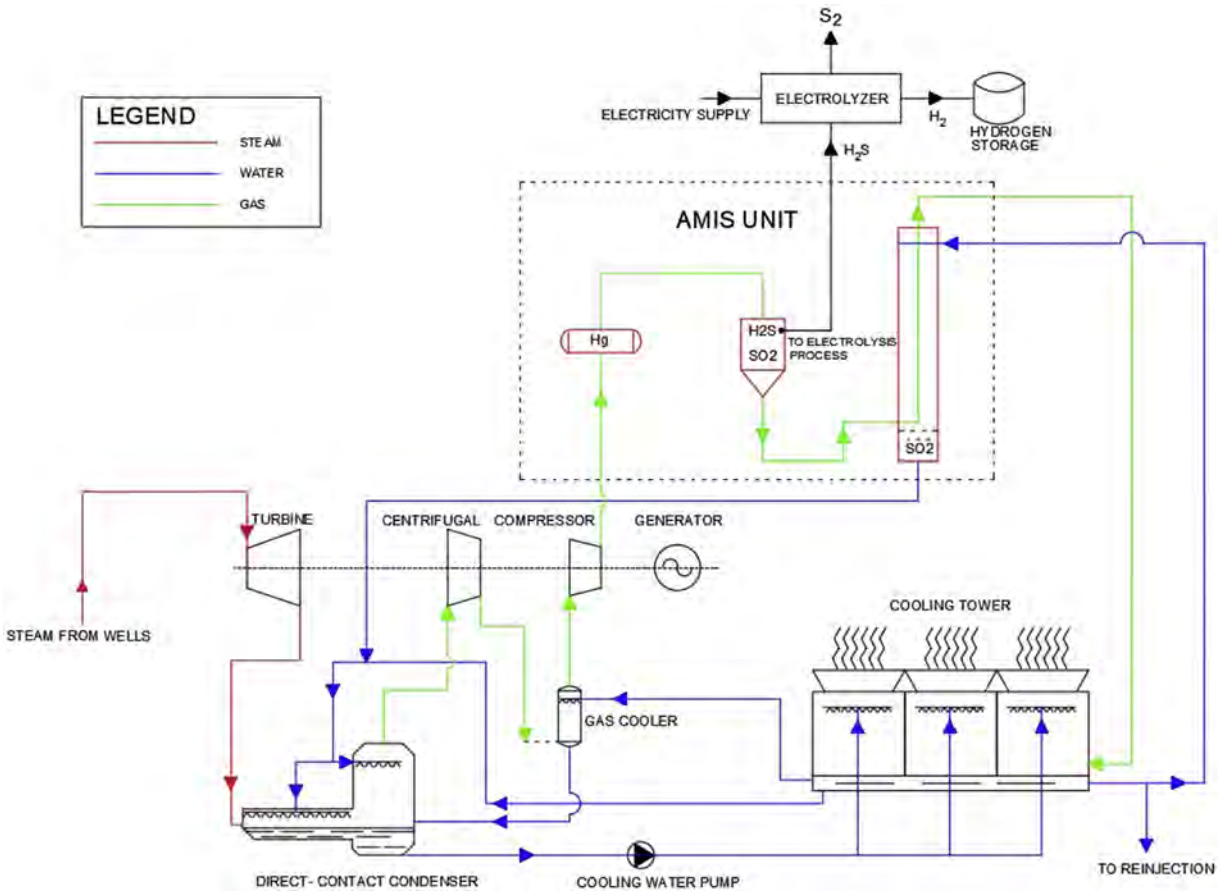

Fig. 2 – Simplified scheme of a standard geothermal power plant equipped with AMIS abatement system [Modified from Ref.1].

chamber from a cathode chamber. The principle of hydrogen sulfide electrolysis is to pass a direct current between two electrodes in order to decompose the hydrogen sulfide into hydrogen and sulfur dimer (Fig. 4).

The process consists of passing a flow with H_2S gas through the anode chamber to contact a catalytic anode. Then, it reacts to produce sulfur dimer, protons and electrons. The protons pass through the membrane from the anode to the cathode chambers where they combine with electrons to form diatomic hydrogen gas at the cathode. During the process, both the anode and the cathode are maintained at a temperature of 150 °C. Gaseous sulfur dimer is collected from the anode compartment and hydrogen is removed from the cathode compartment as shown in Fig. 4. The chemical reactions taking place in the PEM electrolysis at the anode and the cathode are as follows:

$$H_2S \rightarrow \frac{1}{2} S_2 + 2H^+ + 2e^- \quad (2)$$

$$2H^+ + 2e^- \rightarrow H_2 \quad (3)$$

In selecting the membrane, it is important to choose an electrolyte in which the proton conductivity rises rapidly with temperature such as recently developed solid acid electrolyte (SAE). Conductivity of Cesium hydrogen sulfate ($CsHSO_4$) is shown in Fig. 5. The conductivity scale is logarithmic. In temperatures between 120 °C and 150 °C, the conductivity rises up to about 4 orders of magnitude, reaching a high conductivity at 150 °C which is the interested zone in the study [13].

System analyses

The thermodynamic performance of the electrolyzer is examined by conducting quantitative energy and exergy analyses. Throughout this analysis, the following assumptions are made accordingly:

- The ambient temperature (T_0) and pressure (P_o) are 25 °C and 101.325 kPa, respectively.
- All streams and components operate steadily at constant operating temperature and pressure at all times.
- All processes take place in steady-state and steady-flow.
- The changes in both potential and kinetic energies and exergies are negligible.
- All gases are ideal.
- The heat transfer between the system and the environment is negligible.

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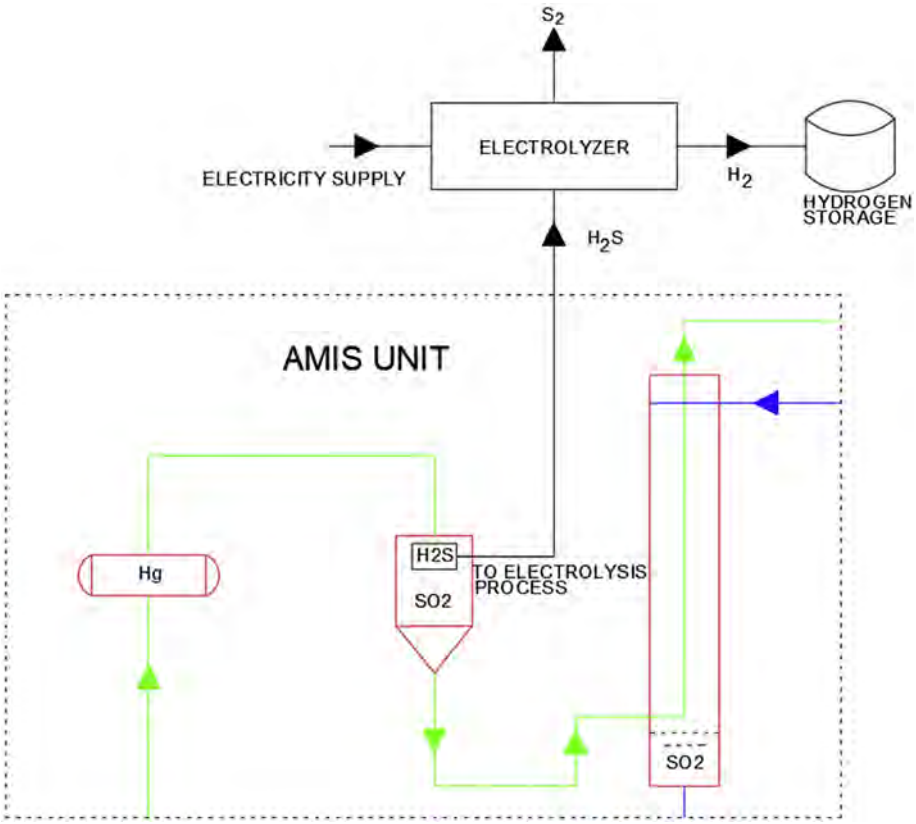

Fig. 3 – Schematic illustration of the modified AMIS system (Modified from Ref. [1]).

- The auxiliary components are well insulated and capable of conducting electricity with no loss.
- The exergies of hydrogen sulfide and sulfur dimer are not taken into account in the electrolyzer.
- Mass flow rate of hydrogen sulfide ($\dot{m}_{H_2S}$) 100 kg/h.

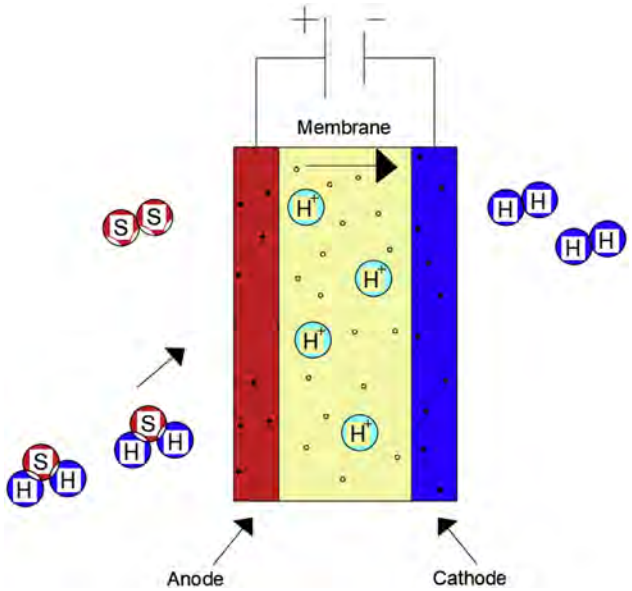

Fig. 4 – Operating principle of the PEM electrolyzer.

- The temperature and pressure of the hydrogen sulfide are 150 °C and 0.8 MPa, respectively.
- The temperature and pressure of the products of electrolysis process are 150 °C and 0.8 MPa, respectively.

The mass balance of the electrolysis process for hydrogen production from hydrogen sulfide can be expressed as [14]:

$$\dot{m}_{H_2S} = \dot{m}_{H_2} + \dot{m}_{S_2} \tag{4}$$

When the changes in kinetic and potential energies are negligible, the steady-flow energy balance relation $\dot{E}_{in} = \dot{E}_{out}$ can be expressed for a chemically reacting steady-flow system more explicitly as [15]:

$$\dot{Q}_{in} + \dot{W}_{in} + \sum \dot{n}_r \left(\overline{h}^{\circ}_f + \overline{h} - \overline{h}^{\circ}\right)_r = \dot{Q}_{out} + \dot{W}_{out} + \sum \dot{n}_p \left(\overline{h}^{\circ}_f + \overline{h} - \overline{h}^{\circ}\right)_p \tag{5}$$

where h°_f represents enthalpy of formation. According to the assumptions, (5) numbered equation can be summarized as:

$$\dot{W}_{in} = \dot{W}_{electricity} = \sum \dot{n}_p \left(\overline{h}^{\circ}_f + \overline{h} - \overline{h}^{\circ}\right)_p - \sum \dot{n}_r \left(\overline{h}^{\circ}_f + \overline{h} - \overline{h}^{\circ}\right)_r \tag{6}$$

After writing energy balance equation for the process, enthalpy values of H_2S, H_2 and S_2 are evaluated with Shomate equations [16] as follows:

$$\overline{h} - \overline{h}^{\circ} = AT + B\frac{T^2}{2} + C\frac{T^3}{3} + D\frac{T^4}{4} - E\frac{1}{T} + F - H \tag{7}$$

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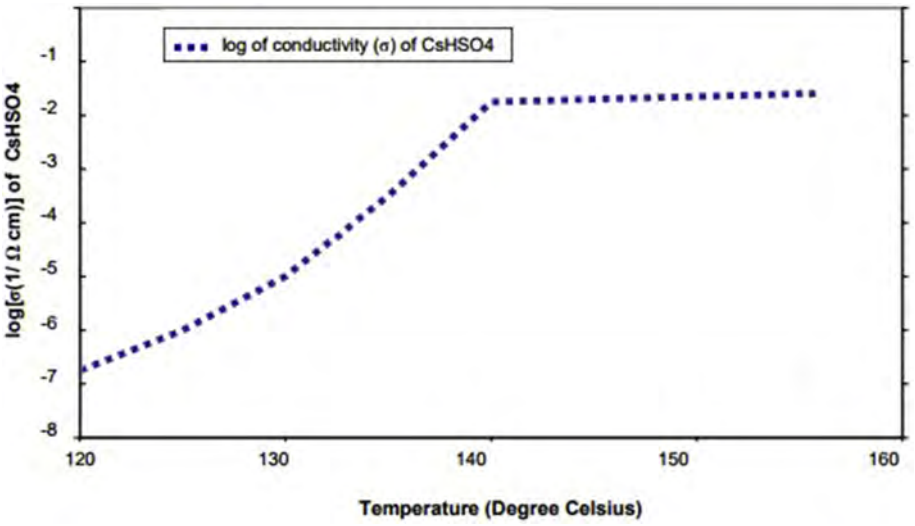

Fig. 5 – Conductivity of $CsHSO_4$ vs. Temperature [13].

Table 2 – Enthalpy of formation and Shomate constants for H_2S, H_2, S_2, O_2, H_2O (Adapted from Ref. [16]).

Compound	h^o_f (kJ/mol)	A	B	C	D	E	F	G	H
H_2S (g)	−20.5	26.88412	18.67809	3.434203	−3.378702	0.135882	−28.91211	233.3747	−20.50202
H_2 (g)	0	33.066178	−11.363417	11.432816	−2.772874	−0.158558	−9.980797	172.707974	0
S_2 (g)	128.60	33.51313	5.065360	−1.059670	0.089905	−0.211911	117.6855	266.0919	128.6003
O_2 (g)	0	31.32234	−20.23531	57.86644	−36.50624	−0.007374	−8.903471	246.7945	0
H_2O (l)	−285.83	−203.6060	1523.290	−3196.413	2474.455	3.855326	−256.5478	−488.7163	−285.8304

where T is 1/1000 of the specified temperature (in K) of compound and A,B,C,D,E,F,G and H are constants, as given in Table 2 for H_2S, H_2 and S_2.

The molar flow rate can be defined as follows:

$$\dot{n} = \frac{\dot{m}}{M} \tag{8}$$

where $\dot{m}$ and M represent mass flow rate and molecular weight, respectively.

Due to the fact that our main product is only hydrogen, the energy efficiency can be written using lower heating value (LHV) of the hydrogen produced and the electricity consumed as follows:

$$\eta = \frac{\dot{m}_{H_2} \cdot LHV_{H_2}}{\dot{W}_{in}} \tag{9}$$

For the electrolysis process the steady-state steady-flow entropy balance equation can be written as [14]:

$$\dot{m}_{H_2S} \cdot s_{H_2S} + \dot{S}_{gen} = \dot{m}_{H_2} \cdot s_{H_2} + \dot{m}_{S_2} \cdot s_{S_2} \tag{10}$$

where $\dot{S}_{gen}$ refers to the rate of entropy increase in the system and s signifies the specific entropy. Specific entropy values of H_2S, H_2 and S_2 are evaluated with Shomate equations [16] as follows:

$$s = A\ln(T) + BT + C\frac{T^2}{2} + D\frac{T^3}{3} - E\frac{1}{2T^2} + G \tag{11}$$

where T is 1/1000 of the specified temperature (in K) of compound and A, B, C, D, E, G are constants, as given in Table 2 for H_2S, H_2 and S_2.

The exergy associated with a process at a specified state is the sum of two contributions: physical and chemical exergies;

$$ex = ex^{ph} + ex^{ch} \tag{12}$$

By ignoring the specific kinetic and potential exergy of the compounds, specific exergy term can be written as:

$$ex = (h - h_0) - T_0(s - s_0) + ex^{ch} \tag{13}$$

Chemical exergy of a gaseous hydrogen fuel can be expressed as follows [17]:

$$\left(ex_{H_2}\right)^{ch} = \left[\overline{g}_{H_2} + \frac{1}{2}\overline{g}_{O_2} - \overline{g}_{H_2O}\right]_{(To,Po)} + \left(e\overline{x}_{H_2O}\right)^{ch} - \frac{1}{2}\left(e\overline{x}_{O_2}\right)^{ch} \tag{14}$$

where $\overline{g}$ represents specific Gibbs function and can be written as follows:

$$\overline{g} = h - Ts \tag{15}$$

Using equations (7) and (11) with given data in Table 2, enthalpy and entropy values of H_2, O_2 and H_2O can be calculated for the ambient temperature. In addition, standard chemical exergies of H_2O and O_2 are shown in Table 3.

Table 3 – Standard chemical values of O_2 and H_2O at $T_0 = 298.15$ K and $P_0 = 1$ atm (Adapted from Ref. [17]).

Substances	$e\overline{x}^{ch}$ (kJ/mol)
O_2 (g)	3.97
H_2O (l)	0.9

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The exergy efficiency of the electrolyzer is given as

$$\Psi = \frac{\dot{n}_{H_2} \cdot \left(ex^{ph} + ex^{ch}\right)_{H_2}}{\dot{W}_{in}} \quad (16)$$

Exergy destruction of the process can be calculated as follows:

$$\dot{E}x_d = T_0 \dot{S}_{gen} \quad (17)$$

Reversible work of the process can be defined as below [15]:

$$\dot{W}_{rev} = \sum \dot{n}_r \left(\overline{h}^{\circ} f + \overline{h} - \overline{h}^{\circ} - T_0 s\right)_r - \sum \dot{n}_p \left(\overline{h}^{\circ} f + \overline{h} - \overline{h}^{\circ} - T_0 s\right)_p \quad (18)$$

Produced hydrogen energy can be calculated as

$$\dot{E}_{hydrogen} = \dot{m}_{H_2} \cdot LHV_{H_2} \quad (19)$$

Results and discussion

The electrolyzer systems for sustainable hydrogen production were analyzed based on the model and assumptions described previously. Using the general mass, energy and exergy balance equations for a chemically reacting steady-flow system, the analyses were conducted for the baseline conditions. The thermodynamic calculations are carried out using the Engineering Equation Solver (EES) software to analyze the effect of the specific electrolysis process parameters on the required electricity work, energy and exergy efficiencies, reversible work, entropy generations and exergy destructions. In this study, the reference state is taken to be 25 °C at the pressure of 101.325 kPa. Throughout this analysis, the subsequent numerical assumptions are made accordingly:

- The mass flow rate of hydrogen sulfide ($\dot{m}_{H_2S}$) 100 kg/h.
- The temperature and pressure of the hydrogen sulfide are 150 °C and 0.8 MPa, respectively.
- The temperature and pressure of the products of electrolysis process are 150 °C and 0.8 MPa, respectively.

The required electrical work for the electrolysis process of hydrogen sulfide decreases when the hydrogen sulfide inlet temperature increases. The required electrical work is around 70 kW for the hydrogen sulfide inlet temperature of 423 K as shown in Fig. 6. As the temperature of the products rises, the electricity demand becomes higher.

The required electrical work for the electrolysis process of hydrogen sulfide increases by the enhancement in the mass flow rate of hydrogen sulfide. The required electrical work is around 76 kW when the mass flow rate of hydrogen sulfide is 30 g/s as shown in Fig. 7. Here, the specific enthalpy values of H_2S and products were calculated through Shomate equations.

In addition, there is a non-linear relation between the energy efficiency and hydrogen sulfide inlet temperature, the energy efficiency of the electrolysis process of hydrogen sulfide increases when the inlet temperature of hydrogen sulfide increases. The energy efficiency is around % 27.8 when the inlet temperature of hydrogen sulfide is 423 K as illustrated in Fig. 8. By contrast, energy efficiency becomes less while temperature of products increases. In other words, to reach the higher energy efficiencies the required electricity work of the electrolysis process should be reduced.

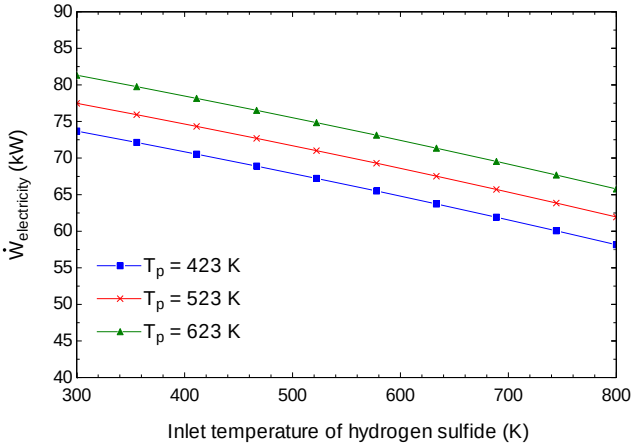

Fig. 6 – Effect of hydrogen sulfide inlet temperature on the required electricity work of the system.

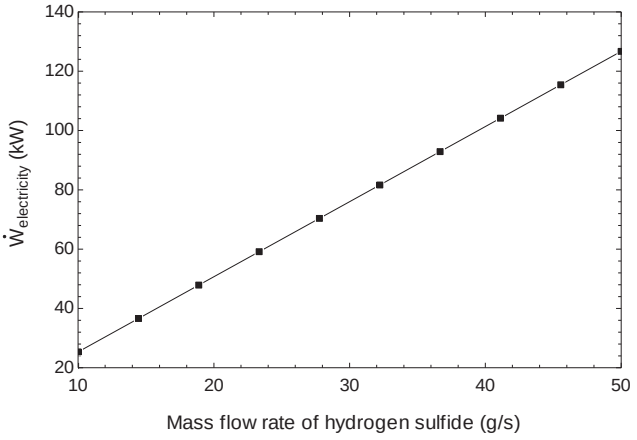

Fig. 7 – Effect of hydrogen sulfide inlet mass flow rate on the required electricity work of the system.

In a similar way, there is a rather non-linear relation between the exergy efficiency and hydrogen sulfide inlet temperature where the exergy efficiency of the electrolysis process of hydrogen sulfide increases when the inlet temperature of hydrogen sulfide increases. The exergy efficiency reaches up to % 57.1, when the inlet temperature of hydrogen sulfide is 423 K, as illustrated in Fig. 9. Similar to the energy efficiency, exergy efficiency of the system declines with the increased product temperature. When it is looked at the efficiency analysis of the electrolyzer, the energy and exergy input rates are the same. But the hydrogen produced has physical and chemical exergy rates according to varying environmental conditions. Due to the fact that under the same conditions with the environment, hydrogen has 12,000 kJ/kg LHV and 117,113 kJ/kg chemical exergy. So, energy

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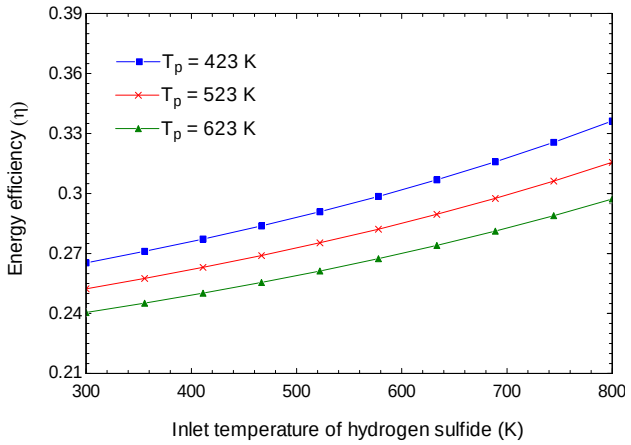

Fig. 8 – Effect of hydrogen sulfide inlet temperature on the energy efficiency of the electrolysis process.

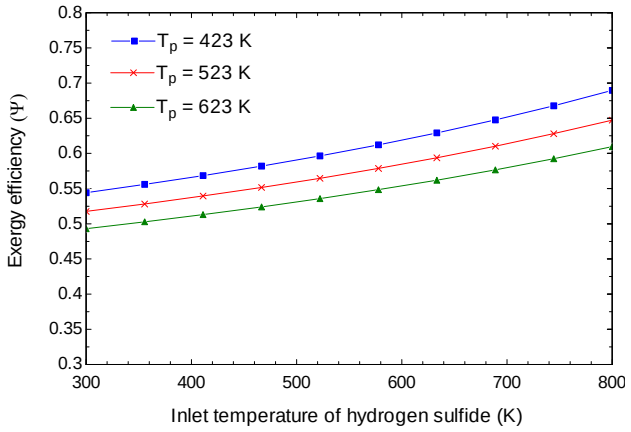

Fig. 9 – Effect of hydrogen sulfide inlet temperature on the exergy efficiency of the electrolysis process.

efficiency will be higher than exergy efficiency. However, under different conditions from the environment hydrogen has physical exergy, so it can change the result.

Fig. 10 demonstrates how exergy efficiency of the electrolysis process changes depending on the ambient temperature. It is clear that, exergy efficiency increases numerically while temperature of ambient rises. The exergy efficiency changes between % 52.3 and % 61.9 when ambient temperature rises from 273 to 323 K.

Reversible work of the electrolysis process of hydrogen sulfide decreases when the inlet temperature of hydrogen sulfide increases. For the hydrogen sulfide inlet temperature of equal to 423 K, the reversible work is around 59.8 kW as presented in Fig. 11.

In a similar way, reversible work of the electrolysis process of hydrogen sulfide decreases when temperature of ambient increases. The reversible work is about 54 kW as temperature of ambient and mass flow rate of hydrogen sulfide are 298 K and 25 g/s, respectively. Also reversible work of the system rises with the increasing mass flow rates of hydrogen sulfide which is clearly seen in Fig. 12.

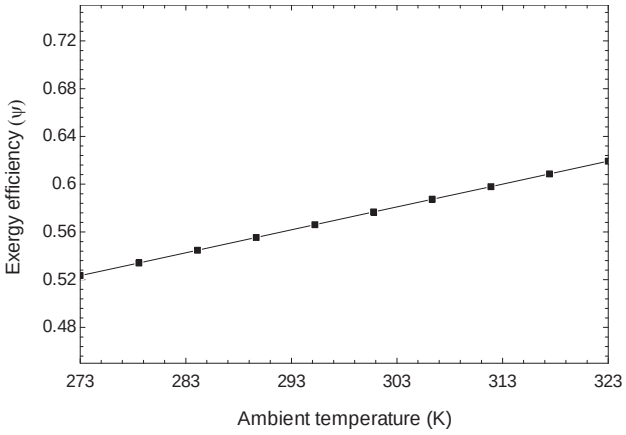

Fig. 10 – Effect of ambient temperature on the exergy efficiency of the electrolysis process.

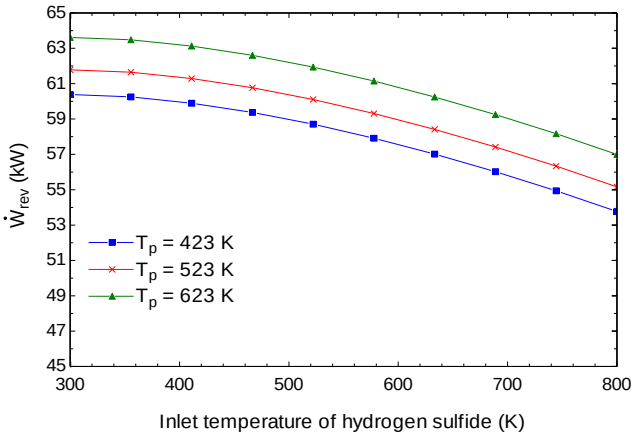

Fig. 11 – Effect of hydrogen sulfide inlet temperature on the reversible work of the system.

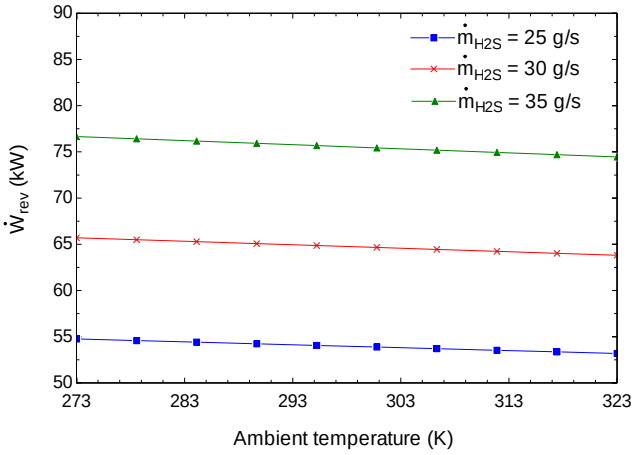

Fig. 12 – Effect of the ambient temperature on the reversible work of the system.

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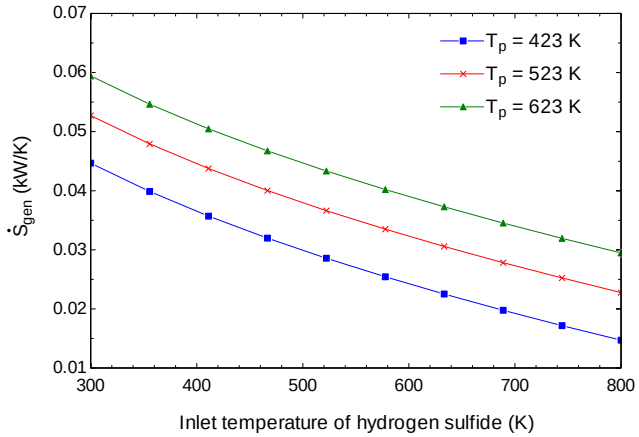

Fig. 13 – Effect of hydrogen sulfide inlet temperature on the entropy generation of the system.

Fig. 13 illustrates how entropy generation changes depending on the inlet temperature of hydrogen sulfide. It is obvious that, entropy generation has higher values at the lower temperatures of hydrogen sulfide.

Exergy destruction of the electrolysis process decreases when inlet temperature of hydrogen sulfide increases. By contrast, exergy destruction reaches the higher values with rising product temperatures as shown in Fig. 14.

For the six different geothermal power plants located in Tuscany region of Italy, H_2S emission was measured by ref. [1] and outputs are listed in Table 4. In addition to the nominal power and AMIS filter; air temperature, wind frequency and directions affect the H_2S emission rate. As clearly shown in the table, AMIS filter minimises H_2S emission. According to the data given in Table 4, AMIS filter reduces H_2S emission approximately 1.3 kg/h per MW. In addition, while the highest H_2S emission was measured in Carboli power plant, the lowest H_2S emission was measured in Nuova Larde power plant.

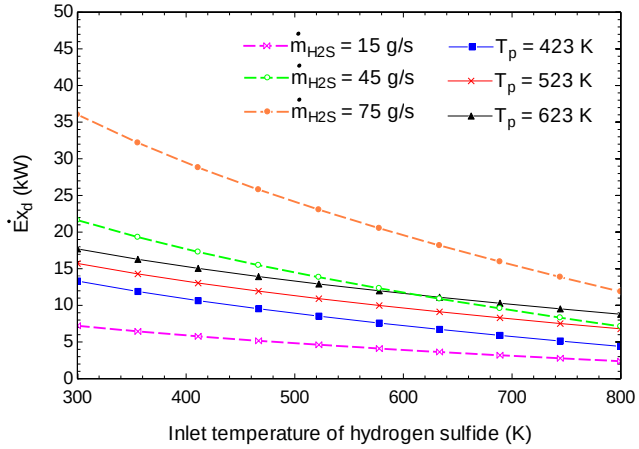

Fig. 14 – Effect of hydrogen sulfide inlet temperature on the exergy destruction of the system.

Table 4 – H_2S emission rates in different geothermal power plants of Italy depending on the presence of the AMIS filter [1].

Name of power plant	Monitoring date	Nominal power (MW)	H_2S emission (kg/h)	Amis filter
Carboli	Jul.2014	20	**46**	No
Cornia	Nov.2014	20	**34.6**	No
Le Prata	May 2014	20	**17.7**	Yes
Nuova Castel	Mar.2014	14.5	**11.1**	Yes
Nuova Larde	Nov.2014	20	**9.3**	Yes
Vallesec	Oct.2014	60	**13.2**	Yes

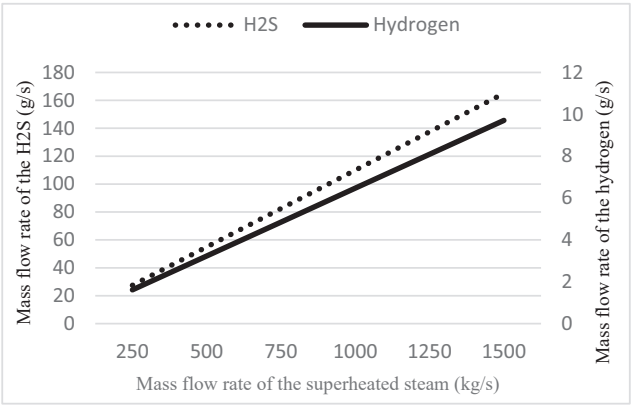

Fig. 15 – Change of H_2S and H_2 mass flow rates depending on mass flow rate of the inlet superheated steam in geothermal power plants.

When mass flow rate of the superheated steam is 1500 kg/s, approximately 165 g/s H_2S is emitted and consequently, 9.7 g/s hydrogen can be obtained (as illustrated in Fig. 15).

There is a linear relation between the mass flow rate of hydrogen sulfide and produced hydrogen energy. Approximately, 2.12 MW energy can be obtained through electrolysis process while mass flow rate of hydrogen sulfide is 3 kg/s as demonstrated in Fig. 16.

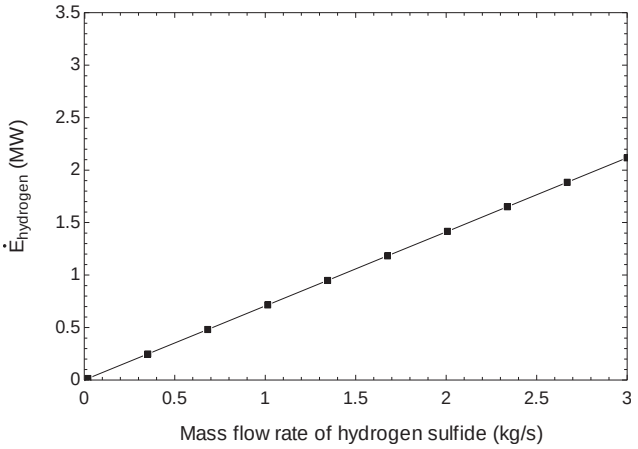

Fig. 16 – The amount of produced hydrogen energy subject to the mass flow rate of hydrogen sulfide.

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Conclusions

Geothermal power plants discharge relatively high amount of H_2S to their operating field which, in turn, can cause unfavorable impacts on the environment and the human body. Furthermore, it is reasonable to produce hydrogen as a promising energy carrier from hydrogen sulfide in geothermal power plants. The present study aims to establish a new model for hydrogen production from hydrogen sulfide by adding a PEM electrolyzer to a geothermal power plant equipped with AMIS abatement system. The performance of the obtained system is investigated thermodynamically. The thermodynamic calculations are carried out using the EES software to analyse the effect of the specific electrolysis process parameters on the required electricity work, energy and exergy efficiencies, entropy generations, and exergy destructions. Results show that the model produces pure hydrogen along with significant rate of reduced hydrogen sulfide. The main outputs of the current study can be summarized as below:

- The required electrical work for the electrolysis process of hydrogen sulfide decreases when the inlet temperature of hydrogen sulfide increases. For the hydrogen sulfide inlet temperature of 300 K, the required electrical work is around 73.7 kW. Once the temperature reaches to 800 K, the required electrical work declines to 58 kW.
- There is a linear relation between the required electrical work and mass flow rate of hydrogen sulfide. The required electrical work changes from 25 kW to 126 kW when the mass flow rate of hydrogen sulfide rises from 10 g/s to 50 g/s.
- Energy efficiency of the hydrogen sulfide electrolysis process exceeds %27.8 as the inlet temperature of hydrogen sulfide increases. The corresponding inlet temperature of hydrogen sulfide is 423 K.
- In a similar way, exergy efficiency of the electrolysis process of hydrogen sulfide rises from % 54.4 to % 68.9 when the hydrogen sulfide inlet temperature increases from 300 K to 800 K. On the other hand, similar to energy efficiency, exergy efficiency of the system declines with increased product temperature. Also, it is clear that the value of exergy efficiency becomes higher with the increasing of ambient temperature.
- Reversible work of the electrolysis process varies between 60 kW and 54 kW while the inlet temperature of the hydrogen sulfide rises from 300 K to 800 K. In addition, reversible work of the system rises with the increasing mass flow rates of hydrogen sulfide and also product temperature. By contrast, reversible work decreases from 60.7 kW to 58.9 kW while ambient temperature rises from 273 K to 323 K.
- When the mass flow rate of the superheated steam is 1500 kg/s, approximately 165 g/s H_2S is emitted and consequently, 9.7 g/s hydrogen can be produced through the electrolysis process. Also, approximately 2.12 MW energy can be obtained while the mass flow rate of hydrogen sulfide is 3 kg/s.
- The required energy under normal conditions is 73.28 kJ/mol for electrolysis of hydrogen sulfide which is 3 times less than electrolysis of water. Therefore, hydrogen production from hydrogen sulfide is a more profitable process than water.
- Geothermal power plants equipped with AMIS abatement system have H_2S emission at lower values. In addition to the nominal power and AMIS filter; air temperature, wind frequency and direction affect the H_2S emission rate.

Nomenclature

$\dot{E}$	Energy (MW)
ex^{ch}	Chemical exergy (kJ/mol)
$\overline{ex}^{ch}$	Standard chemical exergy (kJ/mol)
ex^{ph}	Physical exergy (kJ/mol)
$\dot{E}x_d$	Exergy destruction (kW)
$\overline{g}$	Specific Gibbs function (kJ/mol)
$\overline{h}_f^o$	Enthalpy of formation (kJ/mol)
$\overline{h}^o$	Standard enthalpy (kJ/mol)
$\dot{m}$	Mass flow rate (kg/s)
M	Moleculer weight (kg/kmol)
$\dot{n}$	Molar flow rate (mol/s)
P	Pressure (MPa)
s	Specific entropy (J/mol.K)
$\dot{S}_{gen}$	Entropy generation (kW/K)
T	Temperature (K)
T_0	Temperature of ambient (K)
T_p	Temperature of product (K)
$\dot{Q}$	Heat (kW)
$\dot{W}_{rev}$	Reversible work (kW)

Greek letters

η	Energy efficiency
ψ	Exergy efficiency

Acronyms

AEL	Alkaline electrolyzer
EES	Engineering Equation Solver
EPA	Enviromental Protection Agency
GHG	Greenhouse gases
HTEL	High temperature electrolyzer
LHV	Lower heating value
NCG	Non-condensable gases
PEM	Proton exchange membrane
PEMEL	Polymer electrolyte membrane electrolyzer
SAE	Solid acid electrolyte

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In-depth coverage of water in California and the American West.

Toxic Taps

Why It's Legal to Pump Untreated Canal Water Into Californians' Homes

In the Imperial Valley, nearly 3,000 homes are dependent on raw canal water for showering, washing and other household uses. State

regulators sanction the arrangement, but others are concerned about health risks.

WRITTEN BY	PUBLISHED ON	READ TIME
Tara Lohan	Sep. 14, 2017	Approx. 11 minutes

A canal in the Imperial Valley supplies untreated water to both farms and homes. Tara Lohan

BRAWLEY, CALIFORNIA – It takes Humberto Lugo several minutes to explain how the home he is standing in front of actually gets its water. It's a small, stucco house dwarfed by an expanse of dusty farm fields that sit mostly fallow in September, awaiting the next planting of winter vegetables.

An irrigation canal runs by the front of the property, and brings water not just to the surrounding farms but also to

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homes. Lugo demonstrates how a rubber hose is dropped into the canal and the water, gravity-fed, then pours into an open concrete pool in the house's front yard that is teeming with algae, fish and debris. The home's resident, a renter and farmhand, occasionally dumps some ammonia in the pool before pumping the water to the house to use for showering and other needs.

The home sits about 25 miles from the United States-Mexico border – on the U.S. side.

This kind of do-it-yourself water treatment is common here in California's Imperial Valley in the southeast corner of the state. At last count, 2,757 rural homes here – referred to locally as "countryside homes" – do not have a source of treated, municipal water and instead rely on untreated irrigation water for washing dishes, showering and cleaning.

Lugo works on policy issues for Comite Civico Del Valle, a local nonprofit in Brawley, California, founded by

Living in

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July 5, 2017

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farmworkers in 1987 to increase civic participation in social justice issues, including water and health.

"People should have access to clean drinking water out of their faucet," says Luis Olmedo, the organization's executive director. "This is not the case in the countryside."

Instead, conditions here look more like those found in a developing country, not in a state that boasts the sixth biggest economy in the world. California regulators not only know that thousands of local residents rely on untreated water in their homes – water that travels hundreds of miles in open canals – the State Water Resources Control Board has signed off on the arrangement. The water provider, Imperial Irrigation District, is allowed to send raw, untreated water to homes as long as those homes have a secondary source of clean drinking water – usually a bottled or bulk water delivery.

A pipe is used to siphon water from a canal to a holding pond on a property in the Imperial Valley where the untreated water will be used for household purposes such as showering. (Tara Lohan)

Regulators may seem unconcerned about the health risks, but organizations such as Olmedo's believe it's a public health disaster in the making – and he's got the attention of a scientist who is investigating the health risks of canal water.

Vanessa Galaviz, a toxicologist in the Office of Environmental Health Hazard Assessment at the California Environmental Protection Agency, is launching a study to test the water in the canals for contaminants.

"You have agricultural and industrial runoff," says Galaviz. "There is chemical contamination, there is biological contamination, including basic fecal matter – these are open

canals. There is no water treatment that is done to them."

And that is entirely legal.

A cement pool filled with algae and fish in a yard in the Imperial Valley holds water that will be pumped to a home to be used for showering. (Tara Lohan)

Outdated Infrastructure

At Vivian Perez's home in the Imperial Valley, canal water is siphoned into a concrete cistern that looks like a small well before it's pumped to the house. The family uses it for bathing, washing dishes, washing clothes – everything but cooking and drinking.

"Unfortunately, regardless of how you wash the clothes, sometimes there is a funky smell at times, which is not unusual," says Perez. "We've seen dead fish in the [cistern] or dead animals."

Perez is concerned about the water quality. "You just never know what's in the water, what it does to our skin and our bodies," she says.

Little research has been done to know how much of a health risk canal water may pose and there is no state or local oversight of the jury-rigged systems that residents use to get canal water to their homes. "Everyone is on their own," says Lugo. "They do whatever they think is appropriate," and if they can't afford a water treatment system that often means using pool-cleaning chemicals such as chlorine, ammonia or other disinfectants to try to clean the water before it enters the home.

The Perez family, who have lived in their home since 2003, are investing in a water filtration system, but it will cost at least $9,000 plus ongoing maintenance expenses, says Perez.

That option may be out of reach for many of the area's residents. Folks who live in rural parts of the county are often agricultural workers who live close to their jobs, or because it's more affordable, says Olmedo. The county,

which is predominantly Latino and Spanish-speaking, has a poverty rate of nearly 25 percent.

"The difference is people who have more money can live a safer, better quality of life as opposed to people who are low-income and drawing contaminated water because their water systems may be outdated – it may be just a straight pipe into their home," says Olmedo. "All the elements the water has collected in its entire course from the Colorado through the heavy [agricultural] industry, where it gets possibly assaulted by chemicals, by fecal coliform [bacteria], by potentially manure coming out of feedlots, birds and wildlife defecating into the water – anything: it all ends up in people's homes."

Luis Olmedo, executive director of Comite Civico Dell Valle in Brawley, California, stands on the property of

Vivian Perez in the Imperial Valley. A cement canal behind him supplies water to the home. (Tara Lohan)

Imperial Irrigation District is allowed by state law to supply untreated water to homes because it has an alternative drinking water compliance program. The program requires any home receiving canal water to have a contract with a bulk or bottled water delivery service that comes from an approved list of sellers, says Tina Shields, Imperial Irrigation District's water department manager.

Residents are responsible for the costs of the water delivery, which varies but is often around $50 a month or more. Canal water costs $21 a month.

The water delivery companies are also required to notify Imperial Irrigation District if someone asks to end their drinking water service. "We go out and see why – whether they're moving or it's a bill issue," says Shields. If it's an issue of affordability, Shields says the agency works with the resident on a solution, and the agency has a program for low-income residents that

reimburses up to $30 a month for water delivery.

Imperial Irrigation District sends out periodic reminders that the canal water shouldn't be used for drinking, oral hygiene or washing food that won't be cooked. The latest missive included a note from Shields saying, "We just want to remind customers that there may be disease risks if pathogens are present in untreated canal water, so an approved water source needs to be used for human consumption."

Even though there is a risk of pathogens in the water, the State Water Resources Control Board doesn't consider the use of this water for household purposes a possible health risk.

"The exposure from just bathing in canal water we don't consider a health risk," says Sean Sterchi, district engineer for the State Water Resources Control Board in San Diego. "Any exposure to bacteriological contamination that might be in that water is really considered to be incidental exposure – they're not

supposed to be drinking the water when they are taking a bath or shower."

Galaviz, however, says that some chemicals that may be found in the water from pesticides can be dangerous if exposed to skin or inhaled. Most concerning, she says, is chronic exposure.

And Olmedo worries that children may be especially vulnerable to health impacts from bathing in the water or drinking it while playing in pools and with garden hoses in a region where temperatures hit the triple digits for four months of the year.

"It's easy to forget where that water source came from, especially for kids," Olmedo says.

Esther Bejarano works as an educator for Comite Civico Del Valle and, more than a decade ago, lived in a countryside home that relied on canal water. After washing her son with bottled water as an infant, when he was six months old she decided to bathe him in the sink with the canal water. "I placed him in the water and he got completely red, rashes all over his

body," she says. "He wasn't ready for bathing in the water. It was horrible." Bejarano says she moved back to the city about 10 years ago because of concerns about water and air quality.

Closing the Data Gap

Galaviz is launching a multi-year project to collect and analyze water from the canals to better understand what chemicals and bacteria may be present – but it won't be an easy task. The water travels a great distance to reach the Imperial Valley and then may pass through hundreds of miles of small, lateral canals that move water between farms.

Agriculture here is an industry worth nearly $2 billion a year. Fertile soil gets just 3 inches of rain a year and most of the region relies on imported water that travels hundreds of miles from its snowy origins in the Rocky Mountains.

Following the twists and turns of the Colorado River, Imperial County's water comes within 20 miles (32km) of the Mexico border before it's diverted into the All-American Canal, traveling 80

miles (129km) across the desert. In the Imperial Valley it will end up in one of three main canals which stretch 230 miles (370km) and then feed 1,400 miles (2,250km) of smaller canals.

Imperial Irrigation District, one of the largest public irrigation districts in the West, delivers most of this water to farmers, who irrigate half a million acres of farmland, and thanks to the mild climate, crops are grown – and irrigated – year-round. The valley is the source of much of the nation's winter-grown vegetables, but throughout the year it also produces sugar beets, asparagus, broccoli, carrots, corn, melons, onions, chili peppers and alfalfa, and raises livestock.

Imperial Irrigation District doesn't treat any of its water – about 95 percent of the district's water goes to agriculture and most of the rest supplies municipal water agencies that then treat the water themselves for residents clustered in towns and small cities. Most of the county's 180,000 people receive this treated water.

Despite the extent of the canal network, water-quality testing is done in only four locations, which are mostly in the main canals. Water-quality reports submitted to the state show trace amounts of pesticides such as atrazine and simazine, and other contaminants such as arsenic, uranium and polychlorinated biphenyls (PCBs), although these are at or below the state's maximum contaminant level.

"But the concern is downstream," says Galaviz, where the water passes through more than 1,000 miles of smaller canals running alongside agricultural operations and feedlots.

Galaviz's research project is beginning this month with community outreach and engagement to help map areas of concern and train residents in how to collect water samples. By next summer she says they will begin sampling for water quality in the smaller canals. After that the results will be analyzed, although the second year of the study is not yet funded. The University of Washington (where Galaviz is a faculty member) and the California Office of Environmental

Health Hazard Assessment funded the first year of the program.

"There is a huge gap as to what the public health exposure is going on here," she says. The results will be used to update Cal EnviroScreen, a statewide database that tracks environmental burdens in communities, and will also help inform culturally appropriate outreach and education to the community, says Galaviz. Data from Imperial County shows that that residents face high levels of health burdens from polluted air, pesticides and contaminated water, coupled with high rates of poverty, unemployment and linguistic isolation.

Humberto Lugo of the nonprofit Comite Civico Del Valle walks by a container that supplies clean drinking water to the home of Vivian Perez in the Imperial Valley.
(Tara Lohan)

So far, little research has been done about the potential health impacts of canal water. A report in 2012 by the National Latino Research Center at California State University, San Marcos, sampled the water in 35 randomly selected homes that received canal water and found that water coming from the kitchen faucets in 14 percent tested positive for water contaminants such as pesticides and nitrates, while 70 percent contained bacterial pathogens.

"Study outcomes suggest water contamination is a prevalent silent health risk affecting thousands of individuals in Imperial County today," the report concluded. It also found that some residents are "hesitant to call authorities and report water-related complaints for fear of being forced to repair an intake system or simply being evicted by landlords." For some farmworkers, Olmedo says, landlords may also be employers, and residents can risk losing both their jobs and homes if they speak out about water problems.

Cultural and economic issues can also amplify environmental burdens.

Countryside residents are isolated by culture, geography and language, says Galaviz. "This is a population with a high cumulative impact. That's why it's really important to try and address this issue."

Finding Solutions

While the current system of supplying canal water to homes may be the most affordable way to get water to the homes, "it's not the solution," says Olmedo.

When it comes to better options, though, there seem to be few viable ones.

"It's mentioned in our compliance agreement that [the Imperial Irrigation District is] supposed to get those accounts off canal water and hooked up to municipality whenever it's reasonably available," says the Water Board's Sterchi. But most rural residents are out of reach of municipal water systems, unless new developments warrant an expansion of infrastructure. "Since 1993 I've seen it happen a few times, but it's not a real

active economy – development is really slow," says Sterchi.

Perez says her family's home is about 7 miles (11km) from the nearest town and 4 miles (6km) from the nearest water pipes. "I would love if they would expand it so we could have access to city water as well," she says. "That would be a dream come true."

But it can be prohibitively costly to extend water lines from municipalities, and most water systems won't do so without having the unincorporated community annexed into the city, something that some rural residents may be reluctant to do.

That was the case for one community Sterchi saw. "They are afraid of the cost [of water] and of other services and taxes that come with the annexation process," says Sterchi. "They want to stay unincorporated."

Olmedo believes government needs to do more to respond to the problem or the conditions may create a public health crisis. But he questions whether the political will is there. "I think it really comes down to: is that human

life important enough, are there enough people there to make it a matter of priority?" says Olmedo. "I think that threshold is a political decision and that means these communities need to be empowered enough to be able to be part of that discussion, to have a seat at the table."

#IMPERIAL VALLEY #TOXIC TAPS

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SCIENCE ADVISORY BOARD
A Federal Advisory Committee to the U.S. Environmental Protection Agency

September 29, 2023

EPA-SAB- 23-008

The Honorable Michael S. Regan
Administrator
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

Subject: Commentary on the *Volume Requirements for 2023 and Beyond under the Renewable Fuel Standard Program* (RIN 2060-AV14)

Dear Administrator Regan,

Almost two decades after the Renewable Fuel Standard (RFS) program's creation, the efficacy of the program in reducing greenhouse gas (GHG) emissions remains highly uncertain from a scientific perspective, and many other environmental concerns regarding the RFS have been raised. This Science Advisory Board (SAB) commentary focuses on the first of these issues – the rule's GHG impacts. The SAB commends the EPA for its extensive analysis of the non-GHG environmental impacts of the RFS in documents supporting the 2023 rule. However, the SAB finds that resolving the scientific question of whether use of corn starch ethanol as a fuel reduces GHG emissions or not, relative to gasoline and diesel, is absolutely central to determining whether the EPA is implementing and enforcing a RFS that has net climate benefits, neutral climate impacts, or even net climate damages. There is a vigorous scientific debate about the climate benefits from substituting corn ethanol for gasoline or diesel. Therefore, the SAB recommends that the EPA further evaluate the role the RFS plays in reducing GHG emissions. Future rulemakings that set volume requirements for renewable fuels should more directly address the scientific question of whether corn starch ethanol has lifecycle GHG emissions no higher than 80% of those of gasoline and diesel. This is a statutory requirement for renewable fuels that are included in the volume targets established under the RFS program.

Process Used by the SAB to Develop This Commentary

The SAB established a RFS Workgroup to develop an initial draft of this commentary, which was then approved with revisions by the full SAB on September 21, 2023. The SAB Workgroup consisted of Drs. Sheila Olmstead (chair of the Workgroup), Joseph Arvai, Steven Hamburg, Austin Omer, Emma Rosi, and Peter Thorne. The Workgroup considered the proposed rule, *Volume Requirements for 2023 and Beyond under the Renewable Fuel Standard Program,* the supporting materials and documents, and the deliberations of the entire chartered SAB at its public meeting on January 20, 2023, in developing this commentary.

Commentary on the proposed rule titled: *Volume Requirements for 2023 and Beyond under the Renewable Fuel Standard Program* (RIN 2060-AV14)

The Renewable Fuel Standard (RFS) program was created by the Energy Policy Act of 2005 and amended to its current basic form by the Energy Independence and Security Act (EISA) of 2007. The RFS mandates annual volume targets for a set of renewable fuel categories: cellulosic biofuel, biomass-based diesel, advanced biofuel, and total renewable fuel. In the statutes that created the RFS program, the U.S. Congress set a schedule of volume targets for each of the first three of these four renewable fuel categories, with those statutory targets expiring in 2012 for biomass-based diesel, and in 2022 for the remaining categories. The total renewable fuel category equates to the sum of the advanced biofuel categories specified in the statute and conventional biofuel (mostly corn starch ethanol). The original schedule of biofuel volume targets set by the Congress under the RFS has proven infeasible, given technological and other constraints, so EPA has used its authority to waive most of the cellulosic mandate since 2011, and some of the advanced biofuel and total renewable fuel mandates since 2013 (Lade et al. 2018, Congressional Research Service 2022).[1, 2]

The 2023 RFS rulemaking, governing volumes for 2023, 2024, and 2025, represents the first rulemaking under the Standard in which direct Congressional guidance on volume targets has now expired for all fuel categories, and the EPA is directed to set *de novo* volume targets, in consultation with the Department of Energy and the Department of Agriculture. The SAB has identified this as an opportunity for the EPA to incorporate the best available science on the environmental impacts of conventional and advanced biofuels in setting new volume requirements.

The SAB finds that a linchpin of the statutory definition of the fuels regulated by the RFS is the requirement that renewable fuels included in targets established under the RFS have lifecycle greenhouse gas (GHG) emissions of no more than 80% of those of gasoline and diesel. Of the three often-cited Congressional purposes in creating the RFS (reducing GHG emissions, expanding the nation's renewable fuel sector, and reducing U.S. reliance on imported oil) reducing GHG emissions is the only purpose that falls squarely within the mission of the EPA to "protect human health and the environment." The SAB commends the EPA for its research on non-GHG environmental impacts of the RFS, summarized in the 2023 Rule's Regulatory Impact

[1] Lade, Gabriel E., C.-Y. Cynthia Lin Lawell, and Aaron Smith. 2018. Designing climate policy: lessons from the Renewable Fuel Standard and the blend wall. *American Journal of Agricultural Economics* 100(2): 585-599.
[2] Congressional Research Service. 2022. The Renewable Fuel Standard (RFS): Waiver Authority and Modification of Volumes. CRS Report R44045.

Analysis (RIA) (U.S. EPA 2022)[3] and described more extensively in a report to Congress (U.S. EPA Office of Research and Development 2023),[4] which is currently undergoing external peer review. The SAB recommends that the EPA conduct similar extensive research on GHG impacts of future RFS rules.

For the past three years (2020-2022), conventional biofuels have comprised 73% of the qualifying renewable fuels under the RFS (Congressional Research Service 2022),[5] and the vast majority of this has been corn starch ethanol. There is vigorous scientific debate as to whether corn starch ethanol meets the necessary requirement of having no more than 80% of the lifecycle GHG emissions of gasoline or diesel. Chapter 4 of EPA's RIA for the 2023 RFS rule (U.S. EPA 2022)[6] and the Agency's Model Comparison Exercise Technical Document accompanying the rule (U.S. EPA 2023)[7] cite this literature extensively. In the RIA, estimates of the lifecycle emissions of petroleum gasoline and petroleum diesel range from 84-98 gCO2e/MJ [8](U.S. EPA 2022, pp. 170-171).[9] Thus, to meet the 80% threshold in the RFS, qualifying renewable fuels must have lifecycle GHG emissions no higher than 67-78 gCO2e/MJ. In Figure 4.2.3.3-1 of the RIA (p. 166), seven of the 20 estimates from the models used in the RIA for corn starch ethanol's lifecycle GHG emissions are *above the upper bound* of that threshold. All three of the most recent estimates in that group exceed even the highest estimates of gasoline and diesel lifecycle GHG estimates in Figures 4.2.3.2-1 and 4.2.3.2-2 (U.S. EPA 2022).[10] Thus, corn starch ethanol may not meet the definition of a renewable fuel under the EISA, requiring biofuel GHG emissions not exceed 80% of that of gasoline or diesel.

In particular, recent estimates by Lark et al. (2022a)[11] suggest that the carbon intensity of corn starch ethanol is no less than that of gasoline or diesel, and perhaps up to 24% higher. On the low end, the RIA also cites work by Scully et al. (2021a),[12] which estimates a carbon intensity for corn starch ethanol of 38 gCO2e/MJ, lower than any other study cited. The SAB recognizes that the science is divided on this issue; both Lark et al. (2022a)[13] and Scully et al. (2021a)[14] prompted published and unpublished comments and replies (Spawn-Lee et al. 2021, Scully et al.

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[3] U.S. EPA. 2022. Draft Regulatory Impact Analysis: RFS Standards for 2023-2025 and Other Changes. EPA-420-D-22-003, November. https://www.epa.gov/system/files/documents/2022-12/420d22003.pdf

[4] U.S. EPA, Office of Research and Development. 2023. Biofuels and the Environment: Third Triennial Report to Congress, External Review Draft (ERD). EPA/600/R-22/273. Washington, DC. https://cfpub.epa.gov/ncea/biofuels/recordisplay.cfm?deid=353055

[5] Ibid.

[6] Ibid.

[7] U.S. EPA. 2023. Model Comparison Exercise Technical Document. EPA-420-R-23-017, June. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1017P9B.pdf

[8] grams CO2 emitted per millijoule

[9] Ibid.

[10] This is also clear in Table 4.2.3.13-1 of the RIA, in which the lifecycle GHG emissions for corn starch ethanol range from 38 to 116 gCO2e/MJ, clearly overlapping the 67-78 gCO2e/MJ threshold (U.S. EPA 2022).

[11] Lark, Tyler J., Nathan P. Hendricks, Aaron Smith, Nicholas Pates, Seth A. Spawn-Lee, Matthew Bougie, Eric G. Booth, Christopher J. Kucharik, and Holly K. Gibbs. 2022a. Environmental outcomes of the US Renewable Fuel Standard. *Proceedings of the National Academy of Sciences* 119(9): e2101084119.

[12] Scully, Melissa J., Gregory A. Norris, Tania M. Alarcon Falconi, and David L. MacIntosh. 2021a. Carbon intensity of corn ethanol in the United States: state of the science. *Environmental Research Letters* 16: 043001.

[13] Ibid.

[14] Ibid.

2021b, Alarcon Falconi et al. 2022, Lark et al. 2022b, Lark et al. 2022c, Taheripour et al. 2022).[15, 16, 17, 18, 19, 20] Many other estimates of corn starch ethanol's lifecycle GHG emissions fall within the wide range indicated by these studies as endpoints. The SAB also applauds the EPA for its careful and thorough analysis in the RIA (U.S. EPA 2022)[21] and in its Model Comparison Exercise Technical Document (U.S. EPA 2023),[22] and recognizes that the law requires the EPA to issue new RFS volume requirements in a timely fashion.

However, the SAB finds that resolving the scientific question of whether corn starch ethanol reduces emissions or not, relative to gasoline and diesel, is absolutely central to determining whether the EPA is implementing and enforcing an RFS that has net climate benefits, or one that has neutral climate impacts, or even has net climate damages. Some, though hardly all, recent studies published in peer-reviewed journals, including the *Proceedings of the National Academy of Sciences*, conclude that there are minimal or no climate benefits from substituting corn ethanol for gasoline or diesel.[23]

A recent report by the National Academies recommends that when lifecycle analysis (LCA) is used in policy evaluation with respect to the emissions of low-carbon transportation fuels, analysts should include "an assessment of the degree of confidence that a proposed policy will result in reduced GHG emissions and increased social welfare" (National Academies 2022, p. 4).[24] In promulgating another three years of volume standards with significant uncertainty about

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[15] Spawn-Lee, Seth A., Tyler J. Lark, Holly K. Gibbs, Richard A. Houghton, Christopher J. Kucharik, Chris Malins, Rylie E. O. Pelton, and G. Philip Robertson. 2021. Comment on 'Carbon intensity of corn ethanol in the United States: state of the science'. *Environmental Research Letters* 16: 118001.

[16] Scully, Melissa J., Gregory A. Norris, Tania M. Alarcon Falconi, and David L. MacIntosh. 2021b. Reply to comment on 'Carbon intensity of corn ethanol in the United States: state of the science.' *Environmental Research Letters* 16: 118002.

[17] Alarcon Falconi, Tania M., Fatemeh Kazemiparkouhi, Brittany Schwartz, and David L. MacIntosh. 2022. Letter: Inconsistencies in domestic land use change study. *Proceedings of the National Academy of Sciences* 119(51):e2213961119.

[18] Lark, Tyler J., Nathan P. Hendricks, Aaron Smith, Nicholas Pates, Seth A. Spawn-Lee, Matthew Bougie, Eric G. Booth, Christopher J. Kucharik, and Holly K. Gibbs. 2022b. Reply to Falconi et al.: Economic red herrings and resistance to new modeling hinder progress in assessing ethanol's land use change. *Proceedings of the National Academy of Sciences* 119(51): e2216091119.

[19] Lark, Tyler J., Nathan P. Hendricks, Aaron Smith, Nicholas Pates, Seth A. Spawn-Lee, Matthew Bougie, Eric Booth, Christopher J. Kucharik, and Holly K. Gibbs. 2022c. Reply to Taheripour et al.: Comments on "Environmental outcomes of the U.S. Renewable Fuel Standard," https://files.asmith.ucdavis.edu/Reply_to_Taheripour_et_al.pdf.

[20] Taheripour, Farzad, Steffen Mueller, Hoyoung Kwon, Madhu Khanna, Isaac Emery, Ken Copenhaver, and Michael Wang. 2022. Comments on "Environmental outcomes of the U.S. Renewable Fuel Standard." https://d35t1syewk4d42.cloudfront.net/file/2210/Comments-on-Paper-on-Environmental-Outcomes-of-the-U.S.-Renewable-Fuel-Standard-final.pdf

[21] Ibid.

[22] Ibid.

[23] One reason for the differences among these studies is the recent use of observed crop prices and land-use changes (using satellite data on individual farm fields) to develop empirically-grounded estimates of the impacts of the RFS (Lark 2022a). More research is warranted to determine whether the differences using this approach, in comparison to traditional modeling approaches, will persist.

[24] National Academies of Sciences, Engineering and Medicine. 2022. Current Methods for Life-Cycle Analyses of Low-Carbon Transportation Fuels in the United States. Washington, DC. The National Academies Press. https://doi.org/10.172.26/26402.

the sign as well as the magnitude of the RFS's climate impacts, the Agency missed an opportunity to use the 2023 rulemaking to engage the scientific community on the vital question of whether the majority fuel used for compliance with the RFS, corn starch ethanol, meets this criterion. The SAB emphasizes that, if the RFS does not reduce GHG emissions, it cannot fulfill one of Congress's three stated objectives for the RFS, and the rule may potentially conflict with the Agency's mission. We note that it might have been helpful for the EPA to address this extremely important scientific question within the scope of its otherwise very thorough environmental impacts report currently under peer review (U.S. EPA Office of Research and Development 2023).[25] It would also have been helpful to indicate in the RIA Figure 4.2.3.3-1 (as well as the others in this section) the range of the threshold (67-78 gCO2e/MJ) for achieving lifecycle emissions not above 80% of those of gasoline or diesel so that it is clear to the reader that corn starch ethanol stands out among the fuels considered on this critical point.[26]

Much of the scientific disagreement over the lifecycle GHG emissions of corn starch ethanol and the uncertainty regarding whether it has climate benefits relative to gasoline and diesel has to do with its impacts on land-use change – how much cropland has expanded to grow corn for ethanol in the United States as a result of the RFS, as well as the location and previous use of the land newly used to grow corn for ethanol production. Related factors which also affect carbon intensity include corn yields, choices regarding fertilizer and pesticide application, and farming techniques such as the use of cover crops and no-till practices. These land-use and other lifecycle impacts are difficult to pin down, partly because the carbon intensity of any induced land-use change to produce corn starch ethanol is a moving target, varying with prices, corn yields, and many other variables which change over time and space. It is also true that nitrous oxide emissions are not well constrained by existing models, and given the potency of this GHG, the net GHG benefits can be greatly impacted by the underlying assumptions about these emissions at both the field scale as well as within the receiving waters affected by field application of fertilizers.[27]

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[25] Ibid.

[26] EPA's Model Comparison Exercise Technical Document accompanying the Rule (U.S. EPA 2023) does an excellent job summarizing the models used in the RIA and the sources of variation in life-cycle GHG emissions intensity estimates. However, this analysis does not include among its broad conclusions the important qualitative difference between corn starch ethanol and soybean oil biodiesel in terms of the likelihood of positive vs. neutral or even negative climate impacts. The Technical Document does note that the models included in this Exercise "produced a wider range of LCA GHG estimates for soybean oil biodiesel than corn ethanol" (p. 3). The SAB appreciates this point, but the point obscures the critical nature of the 80% threshold for qualifying fuels. In Figure 4.2.3.4-1 of the RIA (U.S. EPA 2023) describing soybean oil biodiesel's lifecycle GHG emissions, no estimates are above the upper bound of the 67-78 gCO2e/MJ range for gasoline and petroleum diesel. Only two of the 20 estimates of soybean oil biodiesel's lifecycle GHG emissions are above the lower bound of that gasoline/diesel range, and those estimates cite literature between five and 13 years old. All of the estimates drawing on literature from the past three years on soybean oil biodiesel in Figure 4.2.3.4-1 are well below the 80% threshold.

[27] Assumptions about the land-use change impacts of the RFS are also important factors in determining its other environmental impacts, such as impacts on water quality through increased fertilizer application, erosion and other means. EPA's draft Third Triennial Report to Congress on Biofuels and the Environment (U.S. EPA Office of Research and Development 2023) addresses the attribution of impacts from corn ethanol production on water quality and many other environmental endpoints.

The uncertainty around corn starch ethanol's lifecycle GHG emissions impacts might be reduced if the RFS allowed differentiated incentives or constraints on corn starch ethanol qualifying as conventional renewable fuel. For example, ethanol produced from corn grown using varying practices can affect field-scale GHG emissions.[28] In addition, ethanol production facilities may install carbon capture and storage technologies, reducing carbon intensity and making it more likely that this fuel would meet the 80% threshold required under the RFS. Additional data quantifying the impact of climate-smart practices within corn ethanol's lifecycle are warranted for future evaluation of this renewable fuel's climate impacts.

The volume requirements set under the 2023 RFS rule extend through 2025. The SAB recommends that future rulemakings setting volume requirements for 2026 and beyond more directly address the central scientific question of whether corn starch ethanol has lifecycle GHG emissions no higher than 80% of those of gasoline and diesel. The SAB welcomes the opportunity to further engage with the EPA on the evolving science and the differing approaches to estimating the GHG impacts of corn ethanol.

Sincerely,

/s/

Alison C. Cullen, Sc.D.
Chair
Science Advisory Board

[28] The National Academies devote a chapter of their recent report to describing the potential for verification of such practices and technologies, which would be necessary for any standard incorporating differential GHG emissions impacts within the same biofuel category (National Academies 2022).

NOTICE

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February 6, 2024

By Email

Dr. Dorothy Davidson
Chief Executive Officer/President
Midwest Alliance for Clean Hydrogen (MachH2)

Dear Dr. Davidson and MachH2 leadership team,

The undersigned environmental, environmental justice, consumer advocate, public health and community groups from Illinois, Indiana, and Michigan are extremely concerned by efforts from participants in the Midwest Alliance for Clean Hydrogen Hub (MachH2) to eliminate common sense, legally required rules for the federal 45V clean hydrogen production tax credits.[1] We have learned that MachH2 may be coordinating with other hydrogen hubs to try to undermine the 45V rules proposed by Treasury,[2] under which all electrolytic hydrogen projects must prove that they are powered by clean energy that meets three criteria: incrementality, geographical deliverability, and hourly temporal matching. Those criteria are required by law, as supported by the Environmental Protection Agency's (EPA) letter to Treasury,[3] and constitute key protections against increased climate and health pollution and electricity price spikes that could be caused by hydrogen production.

Efforts by MachH2 participants to subvert and weaken those three criteria[4] raise major concerns about the potential harms of this hydrogen hub, especially the harms that would result from

[1] This letter only covers MachH2's efforts to weaken rules for electrolytic hydrogen, and does not cover blue hydrogen, about which there are deep concerns regarding the potential harmful implications for Indiana residents. It also does not cover issues of the use of offsets or negative carbon accounting for biogenic feedstocks, which could also undermine the integrity of the tax credits.

[2] Treasury, Section 45V Credit for Production of Clean Hydrogen, 88 Fed. Reg. 89,220 (Dec. 26, 2023), https://www.federalregister.gov/documents/2023/12/26/2023-28359/section-45v-credit-for-production-of-clean-hydrogen-section-48a15-election-to-treat-clean-hydrogen (45V Proposed Rule).

[3] EPA, Letter to Assistant Secretary Batchelder, Department of Treasury (Dec. 20, 2023), https://home.treasury.gov/system/files/136/45V-NPRM-EPA-letter.pdf (EPA 45V Letter).

[4] MachH2 participants' public comments against aspects of the three pillars include Constellation's white paper: Ensuring Equal Access To Clean Hydrogen https://www.constellationenergy.com/our-work/what-we-do/generation/ensuring-equal-access-to-clean-hydrogen.html; Comments to the IRS from Bloom: https://www.regulations.gov/comment/IRS-2022-0029-0128, Comments to the IRS from BP: https://www.regulations.gov/comment/IRS-2022-0029-0040, Comments to the IRS from Constellation: https://www.regulations.gov/comment/IRS-2022-0029-0192, Comments to the IRS from Invenergy: https://www.regulations.gov/comment/IRS-2022-0029-0176, Comments to the IRS from Plug Power: https://www.regulations.gov/comment/IRS-2022-0029-0059, Comments to the IRS from BayoTech: https://www.regulations.gov/comment/IRS-2022-0029-0105, Comments to the IRS from AirLiquide: https://www.regulations.gov/comment/IRS-2022-0029-0054. See also, Letter from Sen. Cantwell et al. re: 45V (Nov. 6, 2023), https://emails.steptoecommunications.com/21/9498/uploads/694082982-senate-letter-to-admin-on-

diverting existing zero-carbon energy from the grid to hydrogen production. If MachH2 imperils the achievement of our states' climate goals, harms the health of our communities, and causes electricity price spikes that disproportionality impact low- and moderate-income households, it will face stiff opposition from our coalition and from communities that will bear the brunt of harmful, and avoidable, pollution.

The three pillars are essential to meeting the requirements of Section 45V.

Incrementality, deliverability and hourly matching, often referred to as the "three pillars," are required by law. Section 45V awards tax credits based on the "lifecycle greenhouse gas emissions rate" of hydrogen projects. Section 45V defines "lifecycle greenhouse gas emissions" of hydrogen projects by referencing Section 211(o)(1)(H) of the Clean Air Act. This section in turn defines those emissions to include both "direct emissions and significant indirect emissions" linked to the production of a fuel. EPA has supported Treasury's determination that for electrolytic hydrogen projects, induced emissions impacts on the grid resulting from hydrogen projects are "significant indirect emissions" given their magnitude.[5] Absent the three pillars, induced grid emissions from hydrogen production will, in the vast majority of cases, far exceed the emissions limits set forth in 45V and amount to a **cumulative hundreds of millions of tons of carbon emissions increases.** This has been overwhelmingly demonstrated by numerous independent studies and is driven by electrolyzers' very large electricity demand.[6]

Backsliding on Treasury's proposed rule—for example by jettisoning or significantly weakening the incrementality requirement for existing nuclear power plants, as advocated for by some MachH2 participants[7]—would lead to significant emissions increases from hydrogen production, in violation of 45V's statutory requirements. It would also directly harm communities that are home to some of our states' dirtiest power plants, which would run more to replace the zero-carbon energy diverted to hydrogen production.

45v-hydrogen-ptc.pdf (following the October 16, 2023 letter from Sen. Whitehouse et al. urging Treasury to require incrementality, geographic deliverability, and hourly matching, https://www.whitehouse.senate.gov/imo/media/doc/letter_to_treasury_on_45v_hydrogen_tax_credit.pdf).

[5] 45V Proposed Rule, 88 Fed. Reg. 89,229 (stating that incrementality, temporal hourly matching, and deliverability are "important guardrails," and without them, "there is a significant risk that hydrogen production would significantly increase induced grid GHG emissions beyond the allowable levels required to qualify for the section 45V credit"); EPA 45V Letter at 4-5.

[6] Ricks, W., Xu, Q., & Jenkins, J. D. (2023). *Minimizing emissions from grid-based hydrogen production in the United States.* Zenodo. https://doi.org/10.5281/zenodo.10041735; Schittekatte, T., Cybulsky, A., Giovanniello, M., & Mallapragada, D. (2023). *Producing hydrogen from electricity: How modeling additionality drives the emissions impact of time matching requirements* [Preprint]. In Review. https://doi.org/10.21203/rs.3.rs-2834020/v1; Energy Innovation. (n.d.). *Smart Design Of 45V Hydrogen Production Tax Credit Will Reduce Emissions And Grow the Industry—Energy Innovation: Policy and Technology*. Retrieved August 15, 2023, from https://energyinnovation.org/publication/smart-design-of-45v-hydrogen-production-tax-credit-will-reduce-emissions-and-grow-the-industry/; Haley, B., & Hargreaves, J. (2023). *45V Tax Credit: Three-Pillars Impact Analysis*. Evolved Energy Research. https://www.evolved.energy/post/45v-three-pillars-impact-analysis; Blanford, G., & Bistline, J. (n.d.). *Impacts of IRA's 45V Clean Hydrogen Production Tax Credit*. EPRI. Retrieved January 29, 2024, from https://www.epri.com/research/products/000000003002028407.

[7] Comments to the IRS from Constellation: https://www.regulations.gov/comment/IRS-2022-0029-0192.

If it is successful in subverting strong national 45V rules, MachH2 will cause harmful climate and public health consequences that undermine our states' climate goals.

By opposing the three pillars, MachH2 participants are effectively pursuing hydrogen projects that will drive increased fossil fuel generation on the grid. This will disproportionately affect communities living near fossil fuel generators, who are forced to breathe the dirty air from these generators. In fact, 43 environmental justice groups spanning 12 states urged the Biden Administration to require the three pillars for all electrolytic hydrogen production to safeguard against an increase in health-harming pollution from fossil fuel generation.[8] Signatories to that letter include GAIA (Global Alliance for Incinerator Alternatives), Illinois People's Action, Metro East Green Alliance and United Congregations of Metro East from Illinois; Citizens Action Coalition, Earth Charter Indiana, Just Transition Northwest Indiana and Indiana Environment Clean Energy J40, Inc. from Indiana; and the Michigan Environmental Justice Coalition.

Diverting existing zero-carbon energy—notably, nuclear energy—from the grid to hydrogen production without incrementality will also put our states' ambitious climate goals at risk. For example, Illinois' 2021 Climate and Equitable Jobs Act and Michigan's 2023 Clean Energy & Climate Action Package require the retirement of and reduced reliance on fossil fuel power plants. While Indiana does not have a comparable clean energy target, eliminating incrementality requirements will still cost Hoosiers by harming public health and raising energy prices. Allowing hydrogen producers to add substantial new electricity demand on the grid and cannibalize existing zero-carbon energy to meet that demand will drive increased fossil fuel generation to fill the gap and significantly compromise the achievement of those hard-fought policies.

Unless it adheres to the three pillars, MachH2 will drive electricity price spikes for our states' families and businesses.

Treasury's proposed rule ensures that the large new electricity demand from electrolyzers is met, where and when it occurs, by new zero-carbon power that is not already powering homes and businesses. This is necessary to protect against power price spikes from hydrogen production. If MachH2 fails to meet proposed Treasury rules, hydrogen projects will significantly increase electricity prices for families and businesses in our states. Princeton's ZERO Lab found marked power price increases from hydrogen production absent the three pillars.[9]

Cryptomining offers a powerful precedent as, similar to electrolysis, it is a power-hungry process. Cryptomining, which is subject to minimal constraints and requirements, has increased utility bills by tens to hundreds of millions of dollars for households and businesses in upstate New York[10] and led to costly grid strains in Texas.[11] A massive cryptomining operation in

[8] See California Environmental Justice Alliance, Environmental Justice Groups Across the Country Issue Letter to the Department of the Treasury on Hydrogen Funding, https://caleja.org/2023/11/ej-groups-letter-hydrogen-45v-tax-credit/.

[9] Ricks, W., Xu, Q., & Jenkins, J. D. (2023). Minimizing emissions from grid-based hydrogen production in the United States. Zenodo, https://zenodo.org/records/10041735.

[10] Laura Counts, *Power-hungry cryptominers push up electricity costs for locals*, BerkleyHaas (Aug. 3, 2021), https://newsroom.haas.berkeley.edu/research/power-hungry-cryptominers-push-up-electricity-costs-for-locals/.

[11] Elizabeth Napolitano, *Texas paid bitcoin miner more than $31 million to cut energy usage during heat wave*, CBS News (Sept. 7, 2023), https://www.cbsnews.com/news/bitcoin-mining-cryptocurrency-riot-texas-power-grid/.

Indiana has been linked to keeping the coal-fired Merom Generating Station online after its owner had initially promised to retire it.[12] The parallel threat posed by hydrogen production has been robustly documented[13] and has driven a large contingent of consumer groups in the U.S.—including the Illinois Public Interest Group and Citizens Action Coalition in Indiana—to urge the Biden administration to require the three pillars for all hydrogen projects seeking the 45V tax credit.[14]

It would be fundamentally unfair if the MachH2 hub—which would receive taxpayer-funded subsidies from both DOE and Treasury—drives up electricity prices and socializes the costs of increased electricity demand from hydrogen production on to all electricity customers, including low- and moderate-income homes. This would be at jarring odds with concerted efforts by our states to ensure affordable, clean power is available to our homes and businesses.

MachH2 is strongly positioned to succeed with the three pillars.

We urge you to be skeptical of claims that the proposed 45V rules will hinder the success of MachH2. The overwhelming majority of studies[15]—by electrolyzer manufacturers, hydrogen and renewable developers, academics and independent research groups such as the Electric Power Research Institute[16] and Bloomberg New Energy Finance[17]—find three-pillar projects will be very cost-competitive from day one and conclude that the three pillars will support substantial clean hydrogen deployment. In fact, the proposed 45V rules were lauded[18] by a wide range of companies[19] spanning the hydrogen value chain who expressed confidence in the rules' ability to support a thriving, *truly* clean hydrogen industry.

The MachH2 hub is one of the best situated in the country, able to take advantage of excellent wind and solar resources in the Midwest.[20] With the anticipated buildout of new renewable energy in this region, the projects funded by the hub will have no difficulty procuring cost-competitive, new, hourly-matched power from the proposed deliverability zone to claim the 45V tax credit.

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[12] Earthjustice, Cryptocurrency Mining in Indiana (Oct. 23, 2023), https://earthjustice.org/feature/cryptocurrency-mining-indiana.
[13] Energy Innovation, *Consumer Cost Impacts of 45V Rules*, https://energyinnovation.org/wp-content/uploads/2023/11/Consumer-Cost-Impacts-of-45V-Rules-1.pdf
[14] Letter from consumer advocates to White House and Treasury officials on 45V (Oct. 26, 2023), https://www.citizen.org/wp-content/uploads/Consumer-Advocates-45V-Letter.pdf.
[15] Ricks, W. & Jenkins, J. D. (2023). *The Cost of Clean Hydrogen with Robust Emissions Standards: A Comparison Across Studies*. Zenodo, https://doi.org/10.5281/zenodo.7838873.
[16] EPRI, *Impacts of IRA's 45V Clean Hydrogen Production Tax Credit* (Nov. 3, 2023), https://www.epri.com/research/products/000000003002028407.
[17] BloombergNEF, *US Hydrogen Guidance: Be Strict or Be Damned* (Sept. 21, 2023), https://about.bnef.com/blog/us-hydrogen-guidance-be-strict-or-be-damned/
[18] Treasury, *What They Are Saying: U.S. Treasury Department Framework Will Grow Clean Hydrogen Industry* (Dec. 22, 2023), https://content.govdelivery.com/accounts/USTREAS/bulletins/381482f.
[19] Hystor Energy, *Hydrogen Industry Support of Strong 45V Rules* (Dec. 20, 2023), https://hystorenergy.com/hydrogen-industry-support-of-strong-45v-rules/.
[20] RMI, *Explaining the Hydrogen Tax Credit Rules: A First Look With RMI*, https://rmi.org/event/webinar-explaining-the-hydrogen-tax-credit-rules-a-first-look-with-rmi.

MachH2 must support and adhere to strong Treasury rules.

We call on MachH2 leadership , as well as the administrations of Illinois, Indiana, and Michigan, to uphold the strong proposed Treasury rules and ensure that MachH2 adheres to them. This is necessary to build a *truly clean* hydrogen industry in our states, that would not irrevocably compromise our states' climate goals and harm our communities' environmental and economic well-being. In contrast, if MachH2 proceeds with supporting projects that fail to meet the three pillars, MachH2 can expect to face stiff opposition to its hub projects from our coalition and from communities that will bear the brunt of harmful, and avoidable, pollution.

We look forward to discussing our concerns with you at the earliest opportunity.

Sincerely,

Black Labor Week Project Inc.

Breathe Project

Carmel Green Initiative

Citizens Action Coalition of Indiana

Citizens Utility Board of Illinois

Clean Power Lake County

Climate Reality Chicago

Earthjustice

Environmental Defense Fund

Eco-Justice Collaborative

Faith in Place Action Fund

Fox Valley Citizens for Peace & Justice

Fox Valley Electric Auto Association

Freshwater Future

Gary Advocates for Responsible Development

Great Plains Action Society

Groundwork Northeast Revitalization Group

Hoosier Action

Illinois Clean Jobs Coalition

Illinois Environmental Council

Illinois People's Action

Indiana Conservation Voters

Indiana Environmental Clean Energy J40, Inc.

Indiana Friends Committee on Legislation

Industrious Labs

Interfaith Power & Light

Just Transition Northwest Indiana

MADVoters

Metro East Green Alliance

Michigan League of Conservation Voters

Midwest Environmental Justice Network

Natural Resources Defense Council

North Dakota Native Vote

People for Community Recovery

Prairie Rivers Network

Respiratory Health Association

Save Our Illinois Land (SOIL)

Sierra Club Hoosier Chapter

Sierra Club Illinois Chapter

Sierra Club Michigan Chapter

Solar United Neighbors of Indiana

StraightUp Solar

Third Act Illinois

Union of Concerned Scientists

Waub Ajijaak Press & Foundation

We the People of Detroit

We Want Green Too

Cc:

Office of Governor Pritzker

Office of Governor Holcomb

Office of Governor Whitmer

Neil Banwart, Chief Integration Officer, MachH2

Colleen Wright, Chief Strategy Officer, MachH2

Dr. Elizabeth Kocs, Equity Justice Officer, MachH2

Dr. Seth Snyder, Chief Commercialization and Policy Officer, MachH2

Jennifer Dunn, Chief Decarbonization Officer, MachH2

STATE OF CALIFORNIA - HEALTH AND HUMAN SERVICES AGENCY
GRAY DAVIS, *Governor*

DEPARTMENT OF HEALTH SERVICES
DRINKING WATER FIELD OPERATIONS BRANCH
1449 West Temple Street, Room 202
Los Angeles, CA 90026
(213) 580-5723
(213) 580-5711(FAX)

May 16, 2000

Jesse P. Silva
General Manager
Imperial Irrigation District
P.O. Box 937
Imperial, CA 92251

COMPLIANCE AGREEMENT – DEPARTMENT DETERMINATION
SYSTEM NUMBER 1310014, IMPERIAL IRRIGATION DISTRICT

Dear Mr. Silva:

The Department has reviewed the compliance by Imperial Irrigation District (IID) with the terms of the October 27, 1998 Compliance Agreement and subsequent Amendments No. 1 and No. 2. According to the Compliance Agreement, IID chose to implement the exclusions as stated in Section 116275(s) of the California Safe Drinking Water Act (SDWA). In response to Paragraph II.C. of the Compliance Agreement, IID has submitted a report, dated March 13, 2000, indicating the status of all its customers as of March 8, 2000.

IID has a total of 3,543 piped service customers. The number of customers that have been excluded from being considered as a service connection is 3,543. The breakdown by type of exclusion is as follows: the water is used for purposes other than residential use—110 customers; they receive water from a public or permitted water system—219 customers; the account is vacant—152 customers; or an alternative water supply is provided for drinking and cooking—3,062 customers. Upon review of this information, the Department has determined that on March 8, 2000, IID is in compliance with Section 116275 (s) of the SDWA. Therefore, IID has met the requirements of Paragraph II.C. of the Compliance Agreement and is not required to submit an application for a Public Water Supply permit.

IID has implemented methods to ensure ongoing monitoring of their customers to continue meeting the exclusion requirements. We understand that IID will continue to monitor compliance of their customers in accordance with the submitted July 1999 Operations Manual for the SDWA. We understand that IID has hired a SDWA Operations Analyst who will keep the SDWA database program updated on a weekly basis and will follow procedures to ensure compliance with the exclusions to meet the criteria of the SDWA for new connections and when illegal connections are found. If it is determined through your routine tracking system, or by the Department, that you have served a total of 15 or more service connections that have not met the exclusion

Per the Operations Manual, IID will continue to use water haulers that have signed an agreement with IID to provide the alternative water supply to the IID customers. This agreement states that haulers shall not terminate, suspend, revoke or otherwise discontinue service of bottled or hauled water to any party identified on the IID customer list for any reason without prior written consent of IID. If a customer refuses to comply with the requirements for service pipe connections, a Notice of Disconnection to Customers will be issued.

On or before May 1 of each year, IID will submit an annual report to the Department for the previous calendar year, of a summary of failures that occurred during the year and other documentation that the Department may need to assure that IID continues to implement the exclusions as stated in Section 116275(s) of the California Safe Drinking Water Act. The annual report outline submitted with the IID Operations Manual is acceptable to the Department (Attachment 1). IID must submit the first annual report by May 1, 2001.

We have reviewed the submitted IID Conditional Notice Concerning Availability of a Canal Water Connection notice. Please omit the California State Department of Health Services as a condition of approval of water service in item number four as this is Local County jurisdiction.

We commend you on your willingness to work with the Department in assuring that a safe alternative water supply is provided to each of your customers. We look forward to working with you and your staff on developing a long-term plan for providing a domestic water supply to all rural water users. If you have any questions, please contact Kathleen Coates Hedberg, P.E., M.P.H. at (619) 525-4395.

Sincerely,

Gary H. Yamamoto, P.E., Chief
Technical Programs Branch
Division of Drinking Water and
Environmental Management

Enclosure: Annual Report Outline

cc: Imperial County Environmental Health Services

Imperial County Planning & Development Services
Planning / Building

December 21, 2023

Jim Minnick
DIRECTOR

State of California
Office of Planning & Research - State Clearinghouse
1400 Tenth Street
Sacramento, CA 95814
State.clearninghouse@opr.ca.gov

Subject: SCH Number: 2023120104
Notice of Preparation for Lithium Valley Specific Plan and Programmatic Environmental Impact Report Project (SP#22-0001 IS#22-0038)

OPR,

Imperial County is hereby requesting modification to the Notice of Preparation circulation period on the project described below;

SCH Number:	2023120104
Document Title:	Lithium Valley Specific Plan and Programmatic Environmental Impact Report Project
Document Type:	Programmatic Environmental Impact Report (PEIR)
Received By OPR:	12/05/2023
State Review Period Start:	12/07/2023
State Review Period End:	01/12/2024

Specifically, we are requesting the new circulation period to be from **December 7, 2023 to February 20, 2024** due to the holidays and to provide more opportunity for public input.

We appreciate your assistance in this matter. Should you have any questions please contact Diana Robinson at dianarobinson@co.imperial.ca.us or at (442) 265-1736 extension 1751.

Sincerely,

for

Jim Minnick, Director
Imperial County Planning & Development Services

Cc: Miguel Figueroa, County Executive Officer
Rebecca Terrazas-Baxter, Assistant County Executive Officer
Michael Abraham, AIPCP, ICPDS Assistant Division
Diana Robinson, ICPD Planning Division Manager
Files: 10.102: 10.101: 10.104: 10.33
DR/KM/S:\AllUsers\SP22-0001 SALTON SEA RENEWABLE RESOURCE SPECIFIC PLAN\NOP\SP22-0001 NOP Circulation period modification.docx

DOCKETED	
Docket Number:	20-LITHIUM-01
Project Title:	Lithium Valley Commission
TN #:	247861
Document Title:	Report of the Blue Ribbon Commission on Lithium Extraction in California
Description:	N/A
Filer:	Erica Loza
Organization:	California Energy Commission
Submitter Role:	Commission Staff
Submission Date:	12/1/2022 2:21:26 PM
Docketed Date:	12/1/2022

Report of the Blue Ribbon Commission on Lithium Extraction in California

Pursuant to Assembly Bill 1657 (E. Garcia, Chapter 271, Statutes of 2020)

December 2022

BLUE RIBBON COMMISSION ON LITHIUM EXTRACTION IN CALIFORNIA

Chair Silvia Paz, Alianza Coachella Valley, appointed by Governor Gavin Newsom

Vice Chair Ryan E. Kelley, County of Imperial, local city or county government representative, appointed by the California Energy Commission (CEC)

Steve Castaneda, South Bay Irrigation District, Sweetwater Authority, appointed by the Senate Committee on Rules

Rod Colwell, Controlled Thermal Resources economics and incentives representative, appointed by CEC

Roderic Dolega, Ford EV Purchasing national vehicle manufacturer representative, appointed by CEC

Miranda Flores, California Natural Resources Agency, appointed by the Secretary of the California Natural Resources Agency

James C. Hanks, Imperial Irrigation District local public electric utility representative, appointed by CEC

Arthur Lopez, Torres Martinez Desert Cahuilla Indians, local Tribal community representative, appointed by CEC

Luis Olmedo, Comite Civico Del Valle, Inc. disadvantaged and low-income communities' representative, appointed by CEC

Alice Reynolds, California Public Utilities Commission, President of the Public Utilities Commission, appointed by the California Public Utilities Commission[1]

Frank Ruiz, Audubon California's Salton Sea Program, local environmental organization representative, appointed by CEC

Manfred Scott, Quechan Indian Tribe, general member, appointed by CEC

Thomas Soto, Latimer Partner, LLC, appointed by the Speaker of the Assembly

Jonathan Weisgall, Berkshire Hathaway Energy, lithium extraction industry representative, appointed by CEC

1 Martha Guzman Aceves, former California Public Utilities Commission (CPUC) commissioner, served as a Blue Ribbon Commission commissioner from January 2021 to December 2021. CPUC President Alice Reynolds was appointed by the CPUC in April 2022 to succeed commissioner Guzman Aceves on the Blue Ribbon Commission.

ABSTRACT

Assembly Bill 1657, (AB 1657, E. Garcia, Chapter 271, Statutes of 2020)[2] was drafted and signed with the vision to increase possibilities for the Salton Sea region, with both the potential for the area becoming a competitive source of lithium supply that could satisfy more than one-third of the worldwide demand and investing in local and regional economic and community investment opportunities. AB 1657 took effect on January 1, 2021, and required the California Energy Commission to convene and establish a Blue Ribbon Commission on Lithium Extraction in California (Commission), commonly referred to as the Lithium Valley Commission, composed of 14 representatives and experts, to review, investigate, and analyze specific topics relating to lithium extraction in California and submit a report to the Legislature, documenting its findings and any recommendations developed after conducting the required review and analyses. The report also presents perspectives of community members and California Native American Tribes in or near the Riverside and Imperial counties.

The eight topics include:

- Actions that will support the further development of geothermal power that have the potential to provide the cobenefit of lithium recovery from existing and new geothermal facilities.
- Market opportunities for lithium.
- The potential benefits of, and added value to, existing and new geothermal facilities in areas that contain mineral-rich brines for the state, the western energy grid, and the United States, including, but not limited to, grid stability, reliability, and resiliency.
- Methods of overcoming technical and economic challenges currently limiting lithium extraction, processing, and production from geothermal brines.
- Safe environmental methods and standards for lithium extraction from geothermal brines and how this compares to other methods for deriving lithium.
- Potential economic and environmental impacts to the state resulting from extraction, processing, and production of lithium and lithium-dependent products from geothermal brines.
- The importance of, and opportunities for, the application of local, state, and federal incentives and investments to facilitate lithium extraction from geothermal brines.[3]
- Recommendations for legislative or regulatory changes that may be needed to encourage lithium extraction from geothermal brines, including whether the development of a centralized tracking system for lithium project permitting by state and local regulatory agencies would assist with development of the lithium industry.

2 Assembly Bill 1657 (Garcia, E., Chapter 271, Statutes of 2020), https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201920200AB1657.

3 Assembly Bill 1657 states this topic includes, but is not limited to use of enhanced infrastructure financing districts, as defined in Section 53398.51 of the Government Code, or community revitalization investment authorities, as defined in Section 62001 of the Government Code; new employment tax credits in former enterprise zones; income or franchise tax credits under agreements approved by the California Competes Tax Credit Committee; sales tax exemptions for new manufacturing equipment; and leveraging tax incentives in federally recognized opportunity zones.

Keywords: Assembly Bill 1657, lithium, direct lithium extraction, geothermal brine, geothermal power, Imperial Valley, Lithium Valley, Salton Sea, Salton Sea Known Geothermal Resource Area

Please use the following citation for this report:

Paz, Silvia (Chair), Ryan E. Kelley (Vice Chair), Steve Castaneda, Rod Colwell, Roderic Dolega, Miranda Flores, James C. Hanks, Arthur Lopez, Luis Olmedo, Alice Reynolds, Frank Ruiz, Manfred Scott, Tom Soto, Jonathan Weisgall. 2022. *Report of the Blue Ribbon Commission on Lithium Extraction in California*. California Energy Commission. Publication Number: CEC-300-2022-009-F

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Executive Summary

Assembly Bill 1657, (AB 1657, E. Garcia, Chapter 271, Statutes of 2020)[4] was drafted and signed with the vision to increase possibilities for the Salton Sea region, with both the potential for the area becoming a competitive source of lithium supply that could satisfy more than one-third of the worldwide demand and investing in local and regional economic and community investment opportunities. AB 1657 took effect on January 1, 2021, and required the California Energy Commission (CEC) to convene and establish a Blue Ribbon Commission on Lithium Extraction in California (Blue Ribbon Commission or Commission), commonly referred to as the Lithium Valley Commission, composed of 14 representatives and experts, to review, investigate, and analyze specific topics relating to lithium extraction in California and submit a report to the Legislature, documenting its findings and any recommendations developed after conducting the required review and analyses.

This report was developed to meet the requirements of AB 1657. The Blue Ribbon Commission held its first meeting on February 25, 2021, and since that time, held over 23 public meetings over a nearly two-year period. These publicly noticed and conducted meetings provided the Commission an opportunity to learn from representatives of industry, academia, community-based organizations, and public agencies, as well as members of communities and California Native American Tribes (Tribes) living nearby or culturally affiliated with land areas in Imperial County, California under consideration by developers for lithium extraction.

AB 1657

Four statutory findings and declarations explain the state's interest in lithium recovery in California and provide context for why AB 1657 was enacted:

- World demand for lithium is expected to grow as much as tenfold in the next decade, but virtually none is produced in the United States. Almost all of the global lithium supply is mined in Argentina, Chile, China, and Australia.
- The Salton Sea geothermal resource area[5] is well-positioned to become a competitive source of lithium that could satisfy more than one-third of today's worldwide lithium demand, but investment in this resource requires that the technology to recover lithium from geothermal brine on a commercial scale can occur without certain risks and uncertainties.
- There is a national security rationale for developing a domestic supply of lithium. Lithium was listed in the Federal Register as a critical mineral "essential to the economic and

4 Assembly Bill 1657 (Garcia, E., Chapter 271, Statutes of 2020), https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201920200AB1657.

5 The "Geothermal Steam Act of 1970" defines a known geothermal resource area as "…an area in which the geology, nearby discoveries, competitive interests, or other indicia would, in the opinion of the Secretary [Secretary of the Interior], engender a belief in men who are experienced in the subject matter that the prospects for extraction of geothermal steam or associated geothermal resources are good enough to warrant expenditures of money for that purpose." The Salton Sea Known Geothermal Resource Area (Salton Sea KGRA) refers to a geothermal resource on the southeastern side of the Salton Sea near Calipatria (Imperial County). https://www.govinfo.gov/content/pkg/USCODE-2017-title30/html/USCODE-2017-title30-chap23.htm.

national security of the United States" pursuant to the 2017 presidential Executive Order Number 13817 titled "A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals."

- The opportunity for lithium production in California has the potential to unleash billions of dollars of new economic infrastructure development.

These findings and declarations explain why the Blue Ribbon Commission is tasked to review, investigate, and analyze the following eight topics:

- Actions that will support the further development of geothermal power that have the potential to provide the cobenefit of lithium recovery from existing and new geothermal facilities.
- Market opportunities for lithium.
- The potential benefits of, and added value to, existing and new geothermal facilities in areas that contain mineral-rich brines for the state, the western energy grid, and the United States, including, but not limited to, grid stability, reliability, and resiliency.
- Methods of overcoming technical and economic challenges currently limiting lithium extraction, processing, and production from geothermal brines.
- Safe environmental methods and standards for lithium extraction from geothermal brines and how this compares to other methods for deriving lithium.
- Potential economic and environmental impacts to the state resulting from extraction, processing, and production of lithium and lithium-dependent products from geothermal brines.
- The importance of, and opportunities for, the application of local, state, and federal incentives and investments to facilitate lithium extraction from geothermal brines.[6]
- Recommendations for legislative or regulatory changes that may be needed to encourage lithium extraction from geothermal brines, including whether the development of a centralized tracking system for lithium project permitting by state and local regulatory agencies would assist with development of the lithium industry.

The Work of the Blue Ribbon Commission, **California's** Climate Goals and **"Lithium Valley" Development**

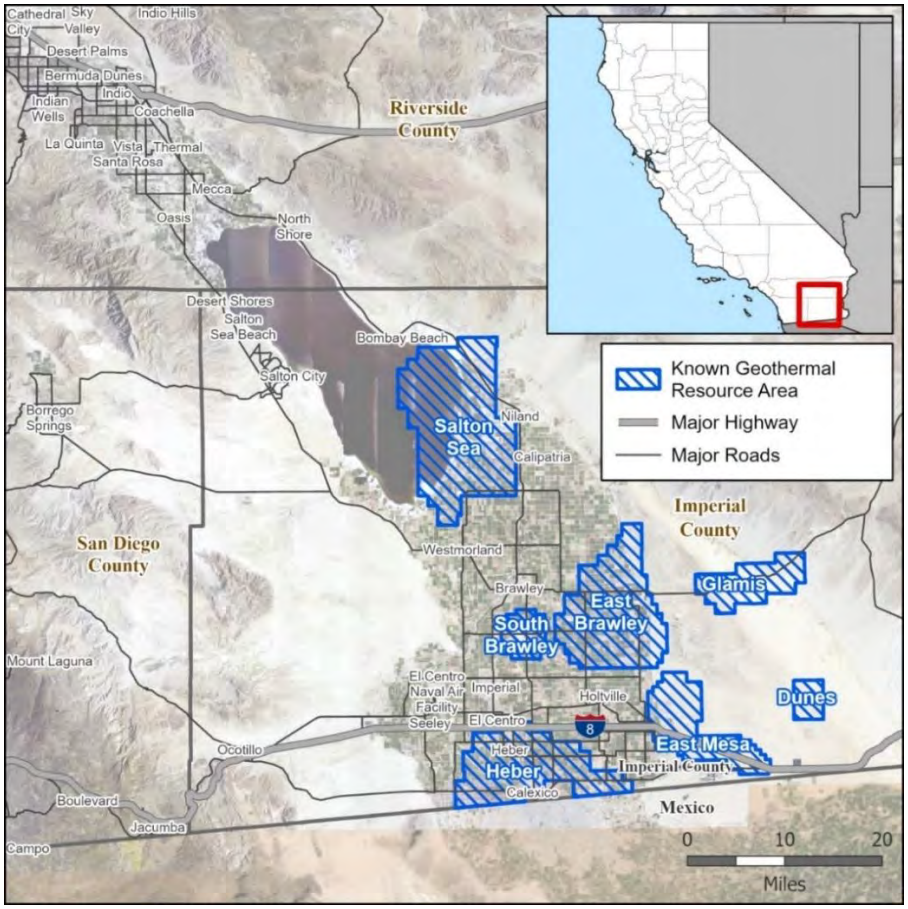
Community engagement is a priority for the Commission, and AB 1657 authorized the Blue Ribbon Commission to obtain and consider public input to develop findings and recommendations on the eight topics. The Commission's work also intersects with other important policy initiatives in the region. These include the state's efforts to implement the Salton Sea Management Plan and its broader policy goals to strengthen climate change resilience, advance zero-carbon and renewable energy technologies, and reduce greenhouse gas emissions economywide. A key element of California's clean energy future includes pursuit

6 Assembly Bill 1657 states this topic includes, but is not limited to use of enhanced infrastructure financing districts, as defined in Section 53398.51 of the Government Code, or community revitalization investment authorities, as defined in Section 62001 of the Government Code; new employment tax credits in former enterprise zones; income or franchise tax credits under agreements approved by the California Competes Tax Credit Committee; sales tax exemptions for new manufacturing equipment; and leveraging tax incentives in federally recognized opportunity zones.

of the development of "Lithium Valley," which is a term used to describe a world-class lithium industry in California centered on recovery of lithium from geothermal brine in the Salton Sea region and the expansion of geothermal energy production, along with creating direct and related economic and community development opportunities.

These topics were of great interest and concern to Tribes and residents of communities nearby or culturally affiliated with the Salton Sea Known Geothermal Resource Area (Salton Sea KGRA). The Salton Sea KGRA is located at the southern end of the Salton Sea, over a half mile below the sea floor; the Salton Sea KGRA is believed to have the highest concentration of lithium contained in geothermal brine in the world. It is rich in many naturally occurring minerals including manganese, zinc, and lithium. The map below shows the KGRAs in Imperial County; lithium recovery is specifically being explored in the Salton Sea KGRA.[7]

Figure ES-1: Map of the Salton Sea and Surrounding Region with Nearby Known Geothermal Resource Areas



Source: CEC Staff

The region surrounding the Salton Sea – the Salton Sea region – as defined by the Commission, consists of Eastern Coachella and Imperial Valleys. It includes all of Imperial

7 Sample(s) from the South Brawley KGRA also indicates a potential high concentration of lithium; however, the South Brawley KGRA is smaller, and the Salton Sea KGRA has the largest known lithium brine deposit and is the focus of proposed lithium development. McKibben, Michael (U.C. Riverside). 2021. "Presentation for the March 25, 2021, Blue Ribbon Commission Meeting." https://efiling.energy.ca.gov/GetDocument.aspx?tn=237359&DocumentContentId=70545.

County and Eastern Coachella Valley in Riverside County, extending from the city of Coachella and unincorporated communities near the Salton Sea, and then farther east to the California-Arizona border. This large area is notably economically distinct with approximately 150,000 people living and working in its communities. Major employment sectors across the area include agriculture and tourism, making these communities more similar to each other than they are to the economies of the Inland Empire and San Diego.[8] The area is rich in cultural history, and it has a high percentage of households where English is not the primary language.[9]

As more fully discussed later in this report, while there is potential for an economic transformation of the Salton Sea region and communities near the Salton Sea KGRA – including Brawley, Westmorland, Calipatria, Niland, North Shore, Mecca, Desert Shores, Bombay Beach, and Salton City – residents and Tribes in and culturally affiliated with these communities have expressed that their past experiences make them skeptical about "Lithium Valley" development efforts and whether and how such development will benefit them instead of worsening existing conditions or creating new harms. Existing conditions include health impacts related to dust and air quality impacts from the receding Salton Sea.

Many indicators demonstrate the existing pollution and health burdens of the communities near the Salton Sea. Most of the census tracts in the region are identified by the California Environmental Protections Agency's CalEnviroScreen mapping tool as disproportionately burdened by multiple sources of pollution.[10] The region also faces unique economic challenges different than those faced by other regions in the state. In July 2022, the unemployment rate in Imperial County was 14.4 percent, the highest of any county in California and more than three times higher than the state average of 3.9 percent.[11] According to the United States (U.S.) Census Bureau's latest five-year estimate, for 2016 to 2020, the median household income in Imperial County was $46,222 (in 2020 dollars) compared to the statewide average of $78,672, and 18.1 percent of the population of Imperial County is living in poverty, significantly higher than the state average of 12.3 percent.[12] Imperial County has a high percentage of adults without a high school education.

The record of Commission proceedings underscores that while the development of a geothermal and lithium based economic hub can lead to new industry and businesses, and individual projects may be subject to the rigorous requirements of the California Environmental Quality Act, there remains outstanding questions and public concern about potential for

8 Blue Ribbon Commission. 2022. Modified by Commissioner discussion, from the definition provided in "Final Letter Regarding Community Economic Resilience Fund (CERF) Recommendations for Salton Sea Region." https://efiling.energy.ca.gov/GetDocument.aspx?tn=242292&DocumentContentId=75794.

9 U.S. Census Bureau, *QuickFacts: Imperial County, California*. Accessed November 29, 2022. https://www.census.gov/quickfacts/fact/table/imperialcountycalifornia/PST045219.

10 CA Office of Environmental Health Hazard Assessment. Accessed November 29, 2022. https://oehha.ca.gov/calenviroscreen.

11 State of California. August 19, 2022. *Monthly Labor Force Data for Counties (July 2022)*. Employment Development Department of the Labor Market Information Division. Report 400 C. https://www.labormarketinfo.edd.ca.gov/file/lfmonth/2207rcou.pdf.

12 U.S. Census Bureau, *QuickFacts: Imperial County, California*. Accessed November 29, 2022. https://www.census.gov/quickfacts/fact/table/imperialcountycalifornia/PST045219. Also, U.S. Census Bureau, *QuickFacts: California*. Accessed November 29, 2022. https://www.census.gov/quickfacts/CA.

adverse impacts, environmental or otherwise, on the existing overburdened communities in the region that suffer from poor air quality and a lack of infrastructure. Existing infrastructure gaps include a lack of roads and bridges, or in need of maintenance, adequate streetlights and sidewalks, public transportation and effective mobility options, and communication infrastructure, for example, access to high-speed internet (broadband).

Report Findings and Recommendations

The report provides foundational information about lithium, its role in the global economy and California's clean energy transition, standard methods of extraction and an overview of the recovery of lithium from geothermal brine. It also offers background and context for recovery of lithium from geothermal brine in the Salton Sea KGRA in Imperial County and presents issues of concern raised by community members and Tribes.

For each of the eight topics the Commission was required to consider, the report presents findings and recommendations for consideration to the Legislature, state and local agencies, and lithium recovery project developers.

Key Findings

- Lithium is a core component of lithium-ion batteries that can store and discharge high amounts of energy. Many consumer products use lithium-ion batteries, as do most electric vehicles (EVs) and energy storage technologies. Both EVs and energy storage are important to achieving California's air quality and climate change targets. EVs offer a transportation option that does not emit air pollutants or greenhouse gas emissions from vehicle tailpipes, and energy storage supports grid stability and the broader growth of renewable energy technologies like wind, solar, and geothermal power.
- Due to the high demand for and reliance on lithium-ion batteries in the United States and the world, lithium is seen as a critical mineral important to national security and economic prosperity. Federal and state policies aim to enhance U.S. lithium supply capabilities to meet this demand.
- The Salton Sea KGRA is believed to have the highest concentration of lithium contained in geothermal brines in the world. Geothermal brine is a super-heated naturally occurring underground fluid, enriched with minerals including manganese, zinc and lithium.
- The two prevalent commercial methods for extracting lithium are hard rock mining and evaporation ponds. Mining is environmentally harmful — it scars landscapes, adversely affects ecosystems and habitat, is water- and energy-intensive, and can pollute air and

water resources.[13] Evaporation ponds are water-intensive, can require thousands of square miles of land, and are environmentally destructive.[14,15]

- The environmental impacts of the lithium recovery technologies proposed for use in Imperial County, direct lithium extraction (DLE) from geothermal brine, have a much lower environmental impact than hard rock mining and evaporation ponds. DLE is designed to be a more sustainable and environmentally beneficial approach to lithium recovery in terms of factors such as land use, water use, time to market, and carbon intensity.[16]
- Although the United States has large reserves of lithium in all forms, in January 2022 the only operational U.S. supply of lithium is a brine facility in Nevada using lithium evaporation ponds.[17]
- Interest in, and support for, the development of domestic lithium sources — specifically lithium recovery from geothermal brine in Imperial County — are occurring at the local, state, and national level.
- California's 2022-2023 budget[18] provisions (including the newly adopted Lithium Extraction Tax Law) and opportunities under the federal Inflation Reduction Act of 2022[19] and Infrastructure Investment and Jobs Act[20] and other state and federal programs can provide financial incentives for development of renewable energy, lithium recovery, and a related economic hub near the Salton Sea.
- Members of communities and Tribes near and culturally affiliated with the Salton Sea and Salton Sea KGRA are deeply interested in and concerned about possible impacts to the environment, cultural resources, and public health due to increased development of geothermal power plants and lithium recovery. There is also interest and support for the economic development, job creation, and business opportunities available to the

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13 Parker, S.S., B.S. Franklin, A. Williams, B.S. Cohen, M.J. Clifford, and M.M. Rohde. August 2022. *Potential Lithium Extraction in the United States: Environmental, Economic, and Policy Implications*. The Nature Conservancy. https://www.scienceforconservation.org/assets/downloads/Lithium_Report_FINAL.pdf.

14 Lineen, N., Bhave R., & Woerner, D. 2018. "Purification of Industrial Grade Lithium Chloride for the Recovery of High Purity Battery Grade Lithium Carbonate." *Separation and Purification Technology*, 214, 168-173. https://doi.org/10.1016/j.seppur.2018.05.020.

15 Bradley, D.C., L.L. Stillings, B.W. Jaskula, L. Munk, and A.D. McCauley. 2017. "Lithium, Chap. K of Critical Mineral Resources of the United States—Economic and Environmental Geology and Prospects for Future Supply." *U.S. Geological Survey*, Professional Paper 1802-K. https://pubs.usgs.gov/pp/1802/k/pp1802k.pdf.

16 DLE technologies are designed to recover lithium and other minerals as the geothermal brine flows through pipelines and tanks and over a surface or substance that removes the lithium and other minerals before returning the brine deep underground. The environmental impacts of each project are assessed during the permitting process.

17 U.S. Geological Survey. 2022. *Mineral Commodity Summaries 2022.* U.S. Geological Survey. https://pubs.usgs.gov/periodicals/mcs2022/mcs2022.pdf.

18 State of California. 2022. *2022–2023 State Budget: Enacted Budget Summary*. https://www.ebudget.ca.gov/budget/2022-23EN/#/BudgetSummary.

19 U.S. Congress. 2022. "Inflation Reduction Act of 2022." H.R. 5376 – 117th Congress. https://www.congress.gov/bill/117th-congress/house-bill/5376/text.

20 U.S. Congress. 2021. "Infrastructure Investment and Jobs Act." H.R. 3684 – 117th Congress. https://www.congress.gov/bill/117th-congress/house-bill/3684/text.

community and Tribes. There are many questions about potential impacts as well as how residents will benefit from and not be harmed by this development.

Recommendations

On November 17, 2022, the Commission took action to finalize the report, including deliberation on possible recommendations. Table 1 in Chapter 5 documents the 15 recommendations adopted by the Commission on November 17, 2022, and Table 2 documents the recommendations considered but not adopted.

CHAPTER 1:
Introduction and Background

In 2020, Governor Gavin Newsom signed into law Assembly Bill 1657 (AB 1657, E. Garcia, Chapter 271, Statutes of 2020),[21] which found and declared that:

- World demand for lithium is expected to grow as much as tenfold in the next decade, but virtually none is produced in the United States. Instead, almost all the global lithium supply is mined in Argentina, Chile, China, and Australia.
- The Salton Sea geothermal resource area is well-positioned to become a competitive source of supply that could satisfy more than one-third of today's worldwide lithium demand. But no mining companies will invest in this resource until the technology to recover lithium from geothermal brine on a commercial scale is proven and can occur without certain risks and uncertainties.
- There is a national security rationale for developing a domestic supply of lithium. Lithium was listed in the *Federal Register* as a critical mineral "essential to the economic and national security of the United States" the 2017 presidential Executive Order No. 13817 titled "A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals."
- The opportunity for lithium production in California has the potential to unleash billions of dollars of new economic infrastructure development.

To enable the state to better understand the opportunities and potential challenges of lithium recovery in California, AB 1657 tasked the CEC to convene and establish a Blue Ribbon Commission on Lithium Extraction in California (Blue Ribbon Commission or Commission) to (1) review, investigate, and analyze eight pertinent topics relating to lithium extraction and use in California and (2) submit a report to the Legislature by October 1, 2022, documenting the Commission's findings and recommendations. The eight topics are:

- Actions that will support the further development of geothermal power that have the potential to provide the cobenefit of lithium recovery from existing and new geothermal facilities.
- Market opportunities for lithium.
- The potential benefits of, and added value to, existing and new geothermal facilities in areas that contain mineral-rich brines for the state, the western energy grid, and the United States, including, but not limited to, grid stability, reliability, and resiliency.
- Methods of overcoming technical and economic challenges currently limiting lithium extraction, processing, and production from geothermal brines.
- Safe environmental methods and standards for lithium extraction from geothermal brines and how this compares to other methods for deriving lithium.

21 Assembly Bill 1657 (Garcia, E., Chapter 271, Statutes of 2020), https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201920200AB1657.

- Potential economic and environmental impacts to the state resulting from extraction, processing, and production of lithium and lithium-dependent products from geothermal brines.
- The importance of, and opportunities for, the application of local, state, and federal incentives and investments to facilitate lithium extraction from geothermal brines.[22]
- Recommendations for legislative or regulatory changes that may be needed to encourage lithium extraction from geothermal brines, including whether the development of a centralized tracking system for lithium project permitting by state and local regulatory agencies would assist with development of the lithium industry.

Report Development and Content

This report reflects nearly two years of review, analysis, and investigation by the Blue Ribbon Commission conducted through noticed public meetings. AB 1657 explicitly authorized the Commission to take public input for recommendations. As this report explains, the Commission invited, welcomed, and received extensive questions and comments from community-based organizations, Tribes and residents of nearby communities about the Commission's obligations under AB 1657 and the state's parallel activities for "Lithium Valley" development and implementation of the Salton Sea Management Program.

The report provides foundational information about lithium, the role of lithium in the global economy and California's clean energy transition, a review of the most common methods of lithium extraction – mining lithium from hard rock and extraction from evaporation ponds used in other places – and recovery of lithium from geothermal brine. It then offers background and context for recovery of lithium from geothermal brine in the Salton Sea KGRA and presents issues of concern raised by community members and Tribal representatives.[23] For each of the eight topics the Commission was required by AB 1657 to consider, the report presents findings and recommendations for consideration by the Legislature, state and local agencies, and DLE project developers.

The discussion in this chapter provides context about the development of the report, with a focus on:

- The state's efforts to achieve its climate and clean energy goals
- The meaning of the phrase "Lithium Valley" and state efforts to support and advance "Lithium Valley" development

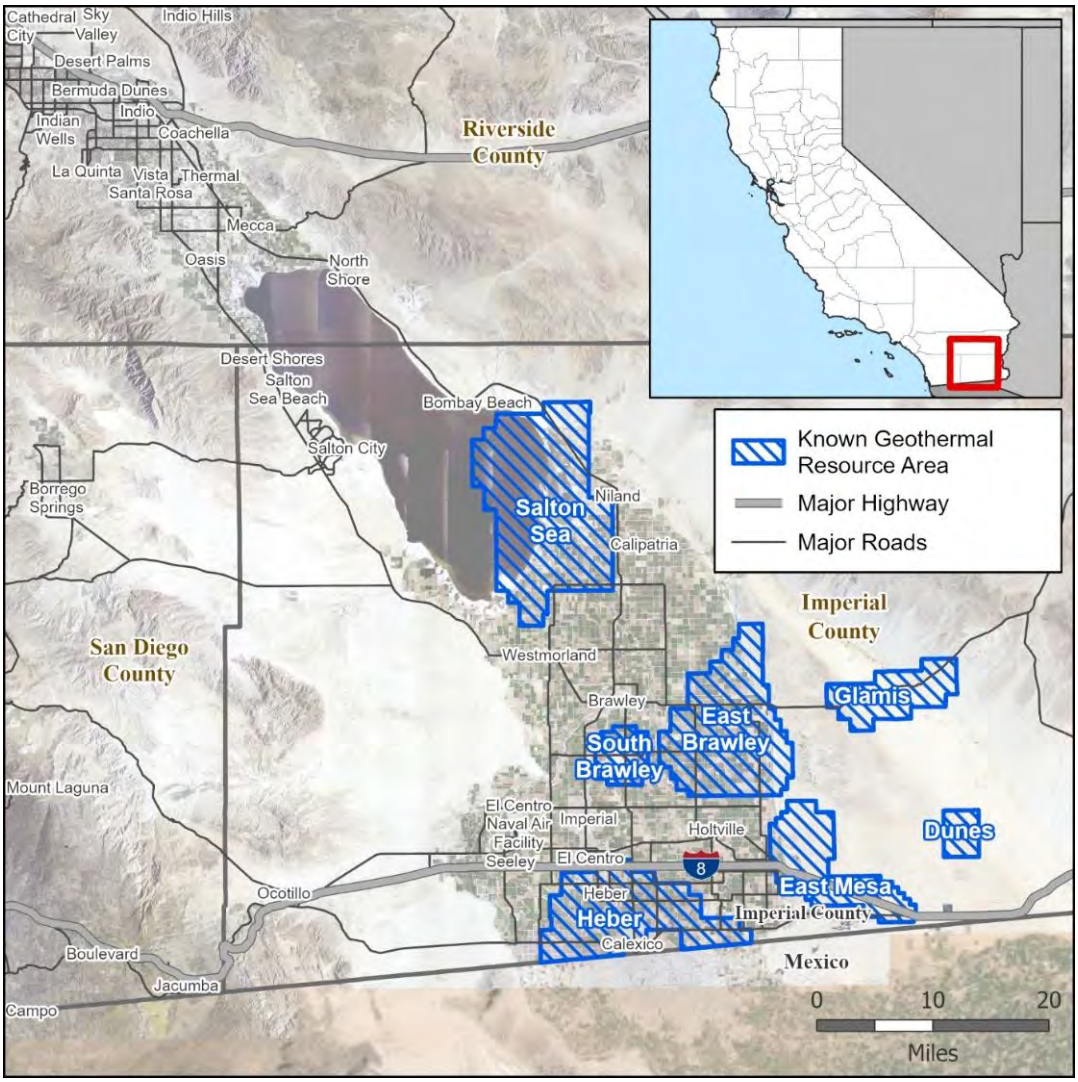
22 Assembly Bill 1657 states this topic includes, but is not limited to use of enhanced infrastructure financing districts, as defined in Section 53398.51 of the Government Code, or community revitalization investment authorities, as defined in Section 62001 of the Government Code; new employment tax credits in former enterprise zones; income or franchise tax credits under agreements approved by the California Competes Tax Credit Committee; sales tax exemptions for new manufacturing equipment; and leveraging tax incentives in federally recognized opportunity zones.

23 Technical materials and transcripts from public meetings can be found at Lithium Valley Commission meeting webpage at https://www.energy.ca.gov/data-reports/california-power-generation-and-power-sources/geothermal-energy/lithium-valley/lithium. Also, technical fact sheets can be found at https://www.energy.ca.gov/data-reports/california-power-generation-and-power-sources/geothermal-energy/lithium-valley.

- The demographics of the surrounding counties and communities nearby the Salton Sea KGRA
- The state's ongoing activities to implement the Salton Sea Management Program, and
- The public process undertaken by the Commission, including engagement with community-based organizations, local residents, and Tribes, to develop the report.

Figure 1 below shows the location of the Salton Sea in Imperial and Riverside Counties as well as the general location of this region in relationship to other county and state borders.

Figure 1: Map of the Salton Sea and Surrounding Region with nearby Known Geothermal Resource Areas



Source: CEC Staff

Achieving California's Climate and Clean Energy Goals

California is a leader in climate policy and transitioning the state's economy to clean electricity and transportation systems. The 100 Percent Clean Energy Act of 2018, commonly referred to as Senate Bill 100 (SB 100, De León, Chapter 312, Statutes of 2018), is a pillar of the state's clean energy policy. SB 100 increased the state's Renewables Portfolio Standard to ensure that

at least 60 percent of the state's electricity comes from eligible renewable energy resources by 2030 and that eligible renewable energy resources and zero-carbon resources supply 100 percent of all retail sales of electricity to California customers and 100 percent of electricity procured to serve all state agencies by December 31, 2045.[24]

In addition to the renewable and zero-carbon energy goals of SB 100, Senate Bill 32 (Pavley, Chapter 249, Statutes of 2016) set an economywide target of reducing greenhouse gas (GHG) emissions to 40 percent below 1990 levels by 2030 and Governor's Executive Order B55-18 established the broader goal for economy wide carbon neutrality by 2045.[25, 26]

The state is taking bold action to meet these greenhouse gas reduction targets, including implementing aggressive zero-emission transportation goals such as the following:[27]

- All new passenger vehicles sold are to be zero-emission by 2035.[28]
- Transition all drayage trucks to be zero-emission by 2035.[29]
- All medium- and heavy-duty vehicles in California are to be zero-emission by 2045 where feasible.

Reducing greenhouse gas (GHG) emissions from the transportation and building sectors through electrification relies on batteries for electric vehicles and storage systems paired with clean sources of electricity to serve the energy demand of buildings. Lithium-ion technologies dominate the markets for batteries and storage systems, which means the state's success in decarbonizing the economy and combating the climate crisis relies on lithium.

In enacting AB 1657, the Legislature found that "[t]he Salton Sea geothermal resource area is well-positioned to become a competitive source of supply that could satisfy more than one-third of today's worldwide lithium demand." This finding is supported by the fact that Salton Sea KGRA has a reservoir — that starts at least 1,500 feet underground — of super-heated naturally occurring fluid (geothermal brine) is very rich in many naturally occurring minerals including manganese, zinc, and lithium. The Salton Sea KGRA is believed to have the highest concentration of lithium contained in geothermal brines in the world.

"Lithium Valley" Development

The term "Lithium Valley" has been used by state leadership and others to describe the development of a world-class lithium industry in California centered on recovery of lithium

24 Senate Bill 100 (De León, Chapter 312, Statutes of 2018) (SB100). https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180SB100.

25 Senate Bill 32 (Pavley, Chapter 249, Statutes of 2016) (SB 32). https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB32.

26 California, Office of the Governor. 2018. "Executive Order B-55-18 to Achieve Carbon Neutrality of September 10, 2018". https://www.ca.gov/archive/gov39/wp-content/uploads/2018/09/9.10.18-Executive-Order.pdf.

27 California, Office of the Governor. 2020. "Executive Order N-79-20 of September 23, 2020." https://www.gov.ca.gov/wp-content/uploads/2020/09/9.23.20-EO-N-79-20-Climate.pdf.

28 California Air Resources Board. 2022. "Final Regulation Order: Adoption of new Section 1961.4, Title 13, California Code of Regulations." Accessed on August 31, 2022. https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2022/accii/acciifro1961.4.pdf.

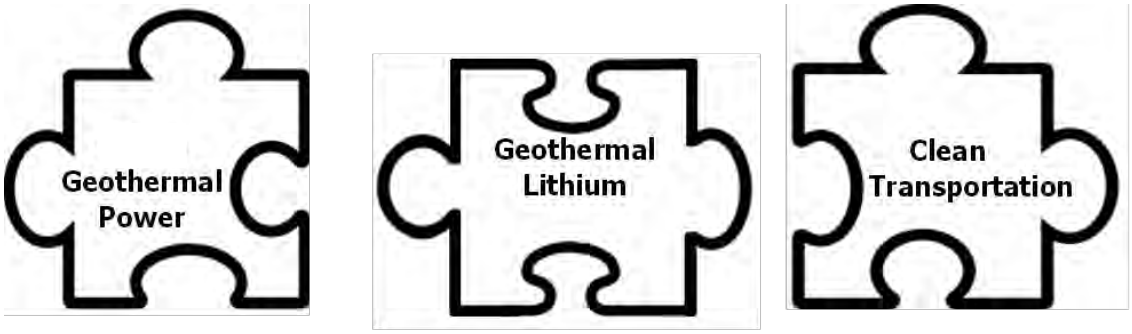
29 Drayage trucks transport containers and bulk goods to and from ports and intermodal railyards.

from geothermal brine in the Salton Sea KGRA and the expansion of geothermal energy production, along with local economic and community development opportunities.

Beginning in 2018, the CEC hosted public meetings on lithium recovery from geothermal brine in California.[30, 31] By February 2020, when the CEC co-hosted a symposium with the Governor's Office of Business and Economic Development (GO-Biz) to facilitate presentations and panel discussions on this topic, the state first introduced "California's 'Lithium Valley' vision of establishing a world-class lithium industry in the state," to support California's clean energy future.

The term "Lithium Valley" is intended to draw a comparison to the term "Silicon Valley," which is recognized as "a region in Northern California that serves as a global center for high technology and innovation" whose economy has been centered around the material silicon.[32] Silicon Valley is viewed globally as setting a standard of success for technology innovation and thriving economic technology hubs. The state sees potential for "Lithium Valley" to be an economic hub (economic ecosystem) centered by geothermal power and lithium recovered from geothermal brine, and a lithium battery supply chain.[33]

Figure 2: Key Elements of Lithium Valley Development



Source: CEC staff

Since 2020, Lithium Valley development has been a significant topic of interest for both Governor Newsom and the Legislature. For example, in 2021, the California State Assembly established the Select Committee on California's Lithium Economy, led by Assemblymember

30 California Energy Commission. 2018. "Lead Commissioner Workshop on Lithium Recovery from Geothermal Brine Agenda." https://efiling.energy.ca.gov/GetDocument.aspx?tn=225888&DocumentContentId=56565.

31 California Energy Commission. 2018. "Transcript of the 11/15/2018 Lead Commissioner Workshop on Lithium Recovery from Geothermal Brine." https://efiling.energy.ca.gov/GetDocument.aspx?tn=226069&DocumentContentId=56810.

32 Wikipedia. 2022. "Silicon Valley". Last modified on August 26, 2022. https://en.wikipedia.org/wiki/Silicon_Valley.

33 The term "economic ecosystem" is defined as "a dynamically stable network of interconnected firms and institutions within bounded geographical space." From: Auerswald, Philip Edgar and Lokesh Dani. August 7, 2017. "Economic Ecosystems." In Clark, Gordon L., Maryann P. Feldman, Meric S. Gertler, and Dariusz Wójcik (eds). 2017. *The New Oxford Handbook of Economic Geography*. New York, NY: Oxford University Press. Chapter 13. https://ssrn.com/abstract=3494495.

Eduardo Garcia, and held hearings to explore lithium opportunities to realize a California lithium economy.[34]

On January 10, 2022, Governor Newsom presented his proposed fiscal year 2022–2023 state budget, the California Blueprint, which included proposed actions to support Lithium Valley development and realize state clean energy goals. As the summary for the proposed fiscal year 2022–2023 state budget explained," [t]he state also plans to develop naturally occurring resources of lithium — a critical component of advanced battery technology — to improve the state's ability to store renewable energy while creating high-paying jobs and generating benefits for surrounding communities and all Californians."[35]

The May Revision to the Governor's proposed fiscal year 2022–2023 state budget maintained focus on creating a strategy for Lithium Valley development,[36] and in June 2022, the California Legislature approved, and Governor Newsom signed a budget and related bills that contained provisions specific to geothermal and lithium extraction development, informed in part by the work of the Blue Ribbon Commission.[37]

Specifically, the fiscal year 2022–2023 state budget includes significant financial provisions relating to Lithium Valley development:[38]

- A newly created volume-based tax on lithium extraction that will take effect on January 1, 2023.
    - The tax rate of $400 per metric ton for the first 20,000 tons of lithium carbonate equivalent extracted, $600 per metric ton extracted over 20,000 up to 30,000 metric tons, and $800 per metric ton for lithium carbonate equivalent extracted over 30,000 metric tons
    - Eighty percent of the moneys collected will go to counties where the extraction is occurring, in the same proportion as the tax was collected from those counties. Imperial County is required to distribute no less than 30 percent of the funds it receives to Imperial County communities directly and indirectly impacted by lithium extraction.[39]

34 Select Committee on California's Lithium Economy. 2021. "Informational Hearing of October 6, 2021: Financing Opportunities and Challenges in Building California's Batter Supply Chain." https://www.assembly.ca.gov/asccle.

35 State of California. 2022. *2022–2023 State Budget: Enacted Budget Summary*. Pages 5, 72. https://www.ebudget.ca.gov/budget/2022-23EN/#/BudgetSummary.

36 State of California. 2022. *2022-23 May Revision to the Governor's Budget.* https://www.ebudget.ca.gov/budget/2022-23MR/#/BudgetSummary.

37 Senate Bill 125 (Committee on Budget and Fiscal Review, Chapter 63, Statutes of 2022). https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202120220SB125.

38 Senate Bill 154 (Skinner, Chapter 43, Statutes of 2022). Budget Act of 2022. https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220SB154.

39 The law identifies the directly affected communities as Bombay Beach, City of Brawley, City of Calipatria, Niland, city of Westmorland and the indirectly affected communities as Bard, City of Calexico, Desert Shores, City of El Centro, Heber, City of Holtville, City of Imperial, Ocotillo, Palo Verde, Salton City, Salton Sea Beach, Seeley, Winterhaven, and Vista Del Mar.

- Twenty percent of the moneys collected must be deposited into a newly created Lithium Subaccount within the Salton Sea Restoration Fund administered by the California Natural Resources Agency and allocated for:
    - Operations and maintenance of restoration projects or other public works projects in existence on January 1, 2023 or developed by the state under the Salton Sea Management Plan or an applicable State Water Resources Control Board order.
    - Restoration projects required to meet the state's obligations in any state plan or order related to the management of the Salton Sea.
    - Grants for community engagement, public amenity, capital improvement, or community benefit projects, including projects to help build capacity for meaningful public participation and outreach, at and around the Salton Sea and those communities impacted by the Salton Sea's restoration and development.

- The law also requires that by December 31, 2023, the Department of Tax and Fee Administration, in consultation with the Department of Finance, prepare a study of replacing the volume-based tax on the extraction of lithium with an equivalent tax based on gross receipts.
- $5 million of general fund monies allocated to Imperial County for specified activities related to the development of lithium recovery were directed to be used as follows:
    - $3.8 million to prepare the county's programmatic environmental impact report (EIR) and a health impact assessment and support community outreach for geothermal energy development and lithium extraction, processing, production, and related manufacturing activities within the county.
    - $800,000 to distribute grants for engagement by community-based organizations in the county on the programmatic EIR created by the county for lithium and geothermal energy development efforts in the county.
    - $350,000 to support the activities of an ombudsperson to engage with stakeholders on lithium extraction, rare-earth minerals mining, and renewable energy generation to provide enhanced communication by and between internal departments within the county and assistance in communication with state and federal agencies.
- $80 million in general fund monies for the San Diego State University Brawley Center to support a local workforce pipeline to aid the state's goals for Lithium Valley.

As more fully discussed in this report, the Commission sees an opportunity for Imperial County to initiate public processes and meaningfully engage with community members and Tribes on its planned implementation of the budget provisions and importantly, align its implementation of the budget with Commission recommendations for County implementation of the "Imperial

County Lithium Valley Economic Opportunity Investment Plan and provide public process for community members and Tribes to engage with the County implementation of the Plan."[40]

As stated in a June 2, 2022, letter of support from the Commission on elements of the County Plan to Governor Newsom, Senator Ben Hueso, and Assemblymember Eduardo Garcia, "Imperial County includes several disadvantaged communities and is one of the poorest counties in the state. We believe many elements of the Lithium Valley Economic Opportunity Investment Plan, among other efforts, enable an efficient, secure, and fair development of an industry that has the potential to propel and improve the economic and environmental future of Imperial County residents for generations."[41] To this end, the Commission's June 2 letter supported specific elements of the County Plan, including, but not limited to $5 million for the creation of a Lithium Valley Specific Plan and Programmatic Environmental Impact Report to assist with providing industry with a clear timeline for project delivery and funding for a higher education campus in Imperial County.

Salton Sea Region: Lithium Supply and Regional Context

As more fully discussed later in the report, while there is potential for an economic transformation of the Salton Sea region, the experiences of the residents and Tribes in these communities make some of them skeptical about Lithium Valley development efforts and whether and how such development will benefit them instead of worsening existing conditions or creating new harms.

Residents in communities including Brawley, Westmorland, Calipatria, Niland, North Shore, Mecca, Desert Shores, Bombay Beach, Salton City, and others currently experience adverse health impacts related to dust and air quality impacts from the receding Salton Sea. Local regional residents are particularly concerned with the potential for lithium extraction to worsen existing public health conditions or create new harms.

Many indicators demonstrate the existing pollution and health burdens of the communities near the Salton Sea. Most of the census tracts in the region are identified by the California Environmental Protections Agency's CalEnviroScreen mapping tool as disproportionately burdened by multiple sources of pollution.[42] Representatives of local community-based organizations shared statistics with the Blue Ribbon Commission that show that Imperial County is in the bottom 2 percent of healthy community conditions statewide, in other words, more than 98 percent of other California counties rank higher than Imperial.[43]

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40 Imperial County. 2022. "Lithium Valley Economic Opportunity Investment Plan." https://lithiumvalley.imperialcounty.org/wp-content/uploads/2022/02/LithiumValleyInvestmentPlanLVIP-FINAL-Watermark.pdf.

41 Blue Ribbon Commission on Lithium Extraction in California. 2022. "Letter of Support from the Lithium Valley Commission." CEC Docket 20-LITHIUM-01, TN#: 243533. https://efiling.energy.ca.gov/GetDocument.aspx?tn=243533&DocumentContentId=77369.

42 California Office of Environmental Health Hazard Assessment. "CalEnviroScreen." Accessed November 29, 2022. https://oehha.ca.gov/calenviroscreen.

43 Blue Ribbon Commission. 2022. "Transcript of the May 12, 2022, Blue Ribbon Commission Meeting." Page 105. https://efiling.energy.ca.gov/GetDocument.aspx?tn=243477&DocumentContentId=77306.

The region also faces economic challenges different than those faced by other regions in the state. In June 2022, the unemployment rate in Imperial County was 14.2 percent, the highest of any county in California and more than three times higher than the state average of 3.9 percent.[44] According to the U.S. Census Bureau's latest five-year estimate, from 2016 to 2020, the median household income in Imperial County was $46,222 (in 2020 dollars) compared to the statewide average of $78,672 and 18.1 percent of the population of Imperial County is living in poverty, significantly higher than the state average of 12.3 percent.[45] Imperial County has a high percentage of adults without a high school education.[46]

The record of Commission proceedings underscores that while the development of a geothermal and lithium based economic hub can lead to new industry and businesses, and individual projects may be subject to the rigorous requirements of the California Environmental Quality Act, there remains public concern about potential for adverse impacts, environmental or otherwise, on the overburdened and underserved communities in the region who suffer from poor air quality, and a lack of infrastructure, including a lack of roads and bridges, or in need of maintenance, adequate streetlights and sidewalks, public transportation and effective mobility options, and communication infrastructure, for example, access to high-speed internet (broadband).[47, 48]

Salton Sea Management Program

The California Natural Resources Agency, the California Department of Water Resources, and the California Department of Fish and Wildlife (CDFW) are implementing the Salton Sea Management Program (SSMP) to address air quality and ecological threats at the Salton Sea.

The SSMP 10-year plan (Phase 1: 10-Year Plan) aims to improve conditions around the Salton Sea by constructing projects that create habitat and reduce dust from exposed lakebed on 30,000 acres.[49]

A major project from the Phase 1: 10-Year Plan currently under construction is the 3,770-acre Species Conservation Habitat (SCH) Project, which will create a network of ponds with islands and areas of varying water depths to provide important fish and bird habitat and suppress dust emissions to improve regional air quality. According to the 2020 Annual Report on the

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44 State of California. August 19, 2022. *Monthly Labor Force Data for Counties (July 2022)*. Employment Development Department of the Labor Market Information Division. Report 400 C. https://www.labormarketinfo.edd.ca.gov/file/lfmonth/2207rcou.pdf.

45 U.S. Census Bureau, *QuickFacts: Imperial County, California*. Accessed November 29, 2022. https://www.census.gov/quickfacts/fact/table/imperialcountycalifornia/PST045219. Also, U.S. Census Bureau, *QuickFacts: California*. Accessed November 29, 2022. https://www.census.gov/quickfacts/CA.

46 U.S. Census Bureau, *QuickFacts: Imperial County, California*. Accessed November 29, 2022. https://www.census.gov/quickfacts/fact/table/imperialcountycalifornia/PST045219.

47 Blue Ribbon Commission. 2021. "Transcript for November 17, 2021, Lithium Valley Commission Community Forum." CEC Docket 20-LITHIUM-01 TN#: 240766. https://efiling.energy.ca.gov/GetDocument.aspx?tn=240766&DocumentContentId=74208.

48 Blue Ribbon Commission. 2022. "Transcript from July 21, 2022, Blue Ribbon Commission Meeting." https://efiling.energy.ca.gov/GetDocument.aspx?tn=245784&DocumentContentId=79989.

49 California Natural Resources Agency. 2018. "Salton Sea Management Program Phase I: 10-Year Plan." https://resources.ca.gov/CNRALegacyFiles/wp-content/uploads/2018/10/SSMP-Phase-1-10-Year-Plan.pdf.

SSMP, several other community-oriented restoration projects around the Sea have moved forward with local partners, vegetation management work on exposed lakebed progressed, and the state authorized an additional $220 million in funding.[50]

The SSMP team is also working on long term planning for the Salton Sea and is conducting activities including a series of public workshops to inform the development of the Long-Range Plan.[51]

Blue Ribbon Commission Public Process and Community and Tribal Engagement

The CEC convened the Blue Ribbon Commission, commonly referred to as the Lithium Valley Commission, in December 2020 while the state and world were contending with a pandemic. With the support of the CEC due to the Commission not having allocated funding or its own dedicated staff, the Blue Ribbon Commission conducted more than 20 public meetings (almost all conducted remotely through meeting platforms due to the pandemic), including a community forum, and performed the AB 1657-required review, investigation, and analysis relying on CEC staff to provide administrative and technical support.

The CEC created a webpage and docket for the Blue Ribbon Commission to ensure a centralized depository for information and activities — from fact sheets to meeting information and workshop presentations — that was easily accessible to the public, with notices and pertinent documents translated into Spanish. Select documents have also been provided in Purépecha.

Beginning in May 2022, the Blue Ribbon Commission conducted hybrid public meetings that allowed for in-person and virtual participation by Commissioners and the public. The primary in-person locations were held in the communities of Calipatria, Westmorland, Niland, Thermal, and Imperial with interpretation services provided.

With a targeted focus on ensuring public and community engagement in the region, the Blue Ribbon Commission held a community forum on November 17, 2021, with participation by Assemblymember Eduardo Garcia. The forum was conducted with virtual and in-person attendance at four locations in the region. Interpretation services were provided. The Commission also worked with local community-based organizations to get input on how to best approach community engagement. On July 21, 2022, the Blue Ribbon Commission, recognizing the need for additional Tribal and community engagement before issuing its draft report to the Legislature, hosted an all-day meeting with virtual and in-person attendance at two sites, one at the Westmorland Union Elementary School in Westmorland and another at the Torres Martinez Desert Cahuilla Indians Tameka Gym in Thermal. The meeting focused on listening to and learning from Tribal perspectives and community resident perspectives.

The Draft report was released on September 21, 2022, in English, and September 28, 2022, in Spanish. The publication of the Spanish translation of the Draft Report began a 30-day comment period. In an effort to provide a robust public participation opportunity, the

50 California Natural Resources Agency. 2022. "Annual Report on the Salton Sea Management Program." https://saltonsea.ca.gov/wp-content/uploads/2022/02/2022-Annual-Report_English_Feb-24-2022_Final.pdf.

51 State of California. 2022. "Salton Sea Management Program." https://saltonsea.ca.gov/program/.

Commission held three in-person community and Tribal workshops to provide options for oral feedback from residents. In-person workshops on the Draft Report were held in the evenings in Niland (October 18, 2022), North Shore (October 19, 2022), and Salton City (October 20, 2022). The workshops included a broad overview of the Blue Ribbon Commission and its role, facilitated third-party small group discussions on the Draft Report, provided Spanish and Purépecha interpretation services, and distributed translated workshop material to support discussions. The Commission also held an online community and Tribal workshop on October 24, 2022. The public comment period on the initial Draft Report closed on October 28, 2022. Additional public comment opportunities were made available at the October 31, 2022, and November 17, 2022, Commission meetings to provide feedback on report revisions in response to the Commissioner discussions; and the docket remained open for public comment. Chapter 3 provides additional information on community and Tribal perspectives, including those presented during the July 21, 2022, meeting and through additional public comment opportunities.

CHAPTER 2:
Lithium Demand, Supply, Recovery, and Processing

The initial efforts of the Blue Ribbon Commission centered on building a foundational understanding of lithium and where it occurs, the importance of lithium nationally and for California, prevalent lithium extraction methods including hard rock mining and evaporation ponds used in other places, and the technologies proposed to recover lithium from geothermal brine in the Salton Sea KGRA. This chapter summarizes the foundational information that informed the Commission's investigation and analyses under AB 1657.

Lithium and Today's Market

Lithium is a soft, silvery-white metal that can be found in many places throughout the world, typically in mineral compounds in hard rock, sediments, and certain water sources. It occurs naturally and abundantly in the earth and is generally found in three sources — pegmatites or hard rock, sedimentary deposits often referred to as clay, and waters with high concentrations of dissolved salts referred to as *brines*. Salar brines are close to the surface, in contrast, geothermal brines are high-temperature, high-pressure formations deep underground.[52]

Lithium is a core component of lithium-ion batteries that can store and discharge high amounts of energy. Many consumer products use lithium-ion batteries, as do most EVs and energy storage technologies. Both EVs and energy storage are important to achieving California's air quality and climate change targets. EVs offer a transportation option that does not emit air pollutants or greenhouse gas emissions from vehicle tailpipes, and energy storage supports additional use of renewable energy technologies like wind, solar and geothermal power. Due to the high demand for and reliance on lithium-ion batteries in the United States (U.S.) and the world, lithium is seen as a critical mineral important to national security and economic prosperity. To meet this demand, federal and state policies aim to enhance U.S. lithium supply capabilities.

The United States has designated lithium as a critical mineral that is essential to the economic and national security of the United States and has a supply chain vulnerable to disruption.[53] Since lithium is predominantly produced in other countries, the U.S. dependence on foreign sources creates critical risk for state and national efforts.[54] On February 24, 2021, President

52 Blue Ribbon Commission. 2021. "Transcript of the July 29, 2021, Blue Ribbon Commission meeting." Page 35. https://efiling.energy.ca.gov/GetDocument.aspx?tn=239800&DocumentContentId=73245.

53 U.S. President. September 30, 2020. "Addressing the Threat to the Domestic Supply Chain From Reliance on Critical Minerals From Foreign Adversaries and Supporting the Domestic Mining and Processing Industries, Executive Order 13953 of September 30, 2020." *Federal Register* 85, no. 193 (October 5, 2020): 62539. https://www.govinfo.gov/content/pkg/FR-2020-10-05/pdf/2020-22064.pdf.

54 U.S. President. December 20, 2017. "A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals, Executive Order 13817 of December 20, 2017." *Federal Register* 82, no. 246 (December 26, 2017): 60835. https://www.govinfo.gov/content/pkg/FR-2017-12-26/pdf/2017-27899.pdf.

Joseph Biden issued Executive Order 14017 (which builds on prior presidential executive orders), making plain that:

> The United States needs resilient, diverse, and secure supply chains to ensure our economic prosperity and national security. Pandemics and other biological threats, cyber-attacks, climate shocks and extreme weather events, terrorist attacks, geopolitical and economic competition, and other conditions can reduce critical manufacturing capacity and the availability and integrity of critical goods, products, and services*. Resilient American supply chains will revitalize and rebuild domestic manufacturing capacity, maintain America's competitive edge in research and development, and create well-paying jobs. They will also support small businesses, promote prosperity, advance the fight against climate change, and encourage economic growth in communities of color and economically distressed areas*.[55] (Italic added)

The legislative findings for AB 1657, and AB 1657 itself, are aligned with this national policy around lithium, including the *National Blueprint for Lithium Batteries 2021–2030.*[56]

Interest in, and support for, the development of domestic lithium sources -- specifically lithium recovery from geothermal brines in Imperial County, are occurring at the national level. In February 2022, President Biden hosted a roundtable discussion, in which Blue Ribbon Commission Chair Silvia Paz participated, and during which he announced major investments in domestic production of minerals critical for modern technologies. President Biden also asked the Secretary of Energy, Jennifer Granholm, to visit the Salton Sea region to hear directly from local residents and community and government leaders about the opportunities and challenges of advancing a lithium-based economy in the region. Secretary Granholm, White House officials, and Congressman Raul Ruiz, visited the region on April 20, 2022, holding a community listening session in North Shore focused on public health near the Salton Sea. A later meeting was held that day in Calipatria with local community leaders and elected officials to discuss the potential economic effects of lithium development on quality of life, workforce development, and education.[57]

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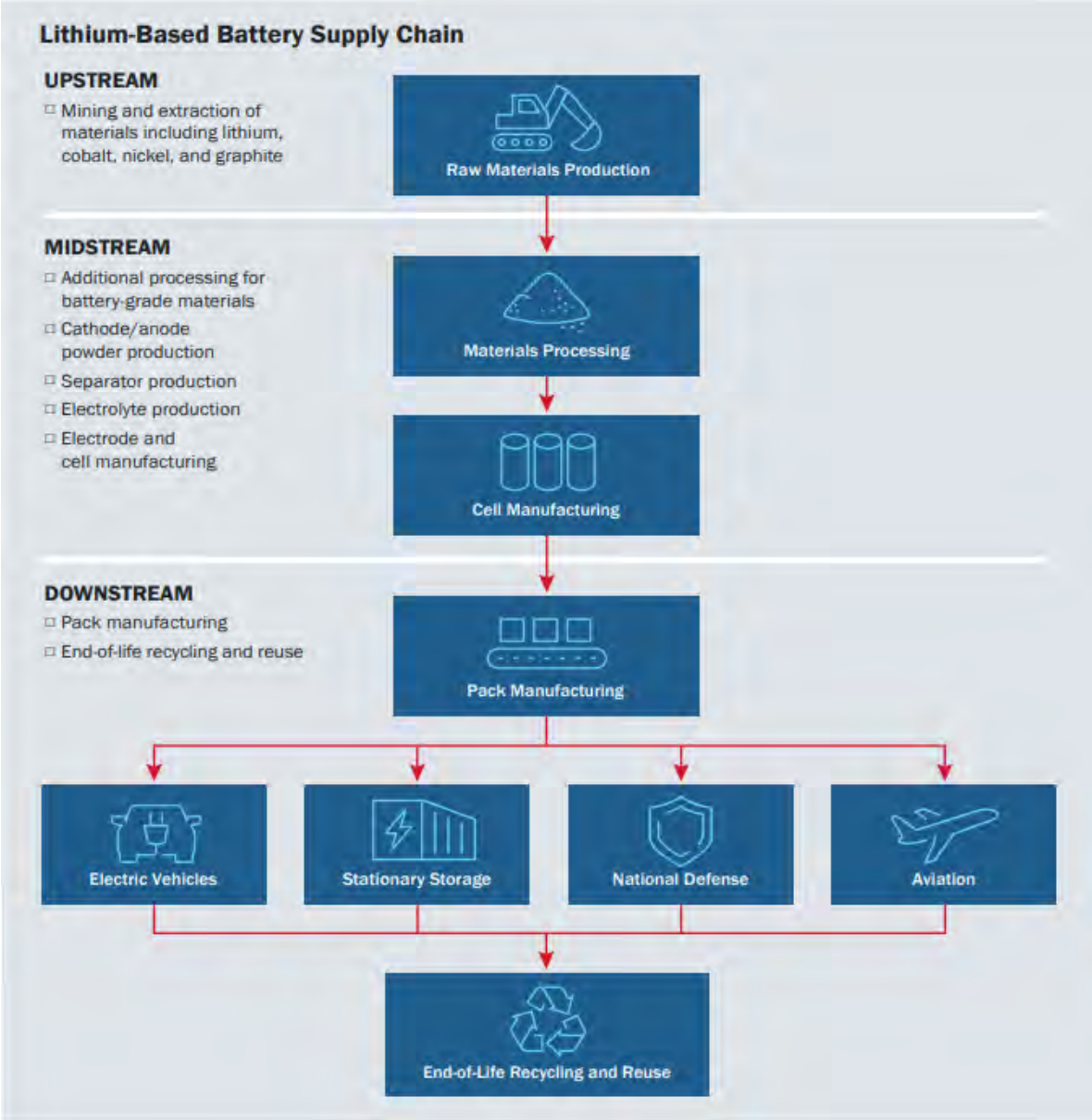
55 U.S. President. February 24, 2021. "America's Supply Chains, Executive Order 14017 of February 24, 2021," *Federal Register* 86, no. 38 (March 1, 2021): 11849. https://www.govinfo.gov/content/pkg/FR-2021-03-01/pdf/2021-04280.pdf.

56 Federal Consortium for Advanced Batteries. 2021. "National Blueprint for Lithium Batteries 2021-2030: Executive Summary." U.S. Department of Energy. DOE/EE-2348. https://www.energy.gov/sites/default/files/2021-06/FCAB%20National%20Blueprint%20Lithium%20Batteries%200621_0.pdf.

57 US Department of Energy. April 27, 2022. "ICYMI: Secretary Granholm Visited California to Highlight President Biden's Investments for an Equitable Transition to Clean Energy." https://www.energy.gov/articles/icymi-secretary-granholm-visited-california-highlight-president-bidens-investments.

Figure 3 shows the lithium-based battery supply chain, which illustrates the various stages for potential end-products of this essential resource, as well as the broader scope of the potential regional economic cluster of lithium-related industries.[58]

Figure 3: Lithium-Based Battery Supply Chain



Source: Federal Consortium for Advanced Batteries[59]

58 Federal Consortium for Advanced Batteries. 2021. "National Blueprint for Lithium Batteries 2021-2030: Executive Summary." U.S. Department of Energy. DOE/EE-2348. https://www.energy.gov/sites/default/files/2021-06/FCAB%20National%20Blueprint%20Lithium%20Batteries%200621_0.pdf.

59 Federal Consortium for Advanced Batteries. June 2021. "National Blueprint for Lithium Batteries 2021-2030: Executive Summary." U.S. Department of Energy. DOE/EE-2348. Page 17. https://www.energy.gov/sites/default/files/2021-06/FCAB%20National%20Blueprint%20Lithium%20Batteries%200621_0.pdf.

Global Lithium Supply

It is estimated that potential global supply of lithium is about 86 million tons. Lithium resources are present in more than 20 countries, including the "Lithium Triangle" countries of Bolivia, Argentina, and Chile (estimated at 50 million tons); the United States (7.9 million tons); Australia (6.4 million tons); and China (5.1 million tons).[60] The 7.9 million tons of lithium reserves identified in the United States exist primarily in California, Nevada, Utah, Arkansas, and North Carolina in ore, sediment, and brine forms, depending on the location.[61]

Although the United States has large reserves of lithium in all forms, the only operational U.S. supply of lithium is a brine facility in Nevada using lithium evaporation ponds.[62] Two new lithium mining operations are in development in Nevada and another in North Carolina. Additional facilities to recover lithium from oil field brines are in development and potentially will use DLE methods.[63]

Although many countries have lithium reserves, Australia, Argentina, Chile, and China accounted for the majority of world lithium supply in 2021.[64] Figure 4 summarizes third quarter 2020 global lithium mining, extraction, and recovery capacity.[65]

60 U.S. Geological Survey. 2021. *Mineral Commodity Summaries 2021*. U.S. Geological Survey. https://pubs.usgs.gov/periodicals/mcs2021/mcs2021.pdf.

61 California Energy Commission. 2021. "Presentation for March 21, 2021, Blue Ribbon Commission Meeting." https://efiling.energy.ca.gov/getdocument.aspx?tn=237359. Slide 19.

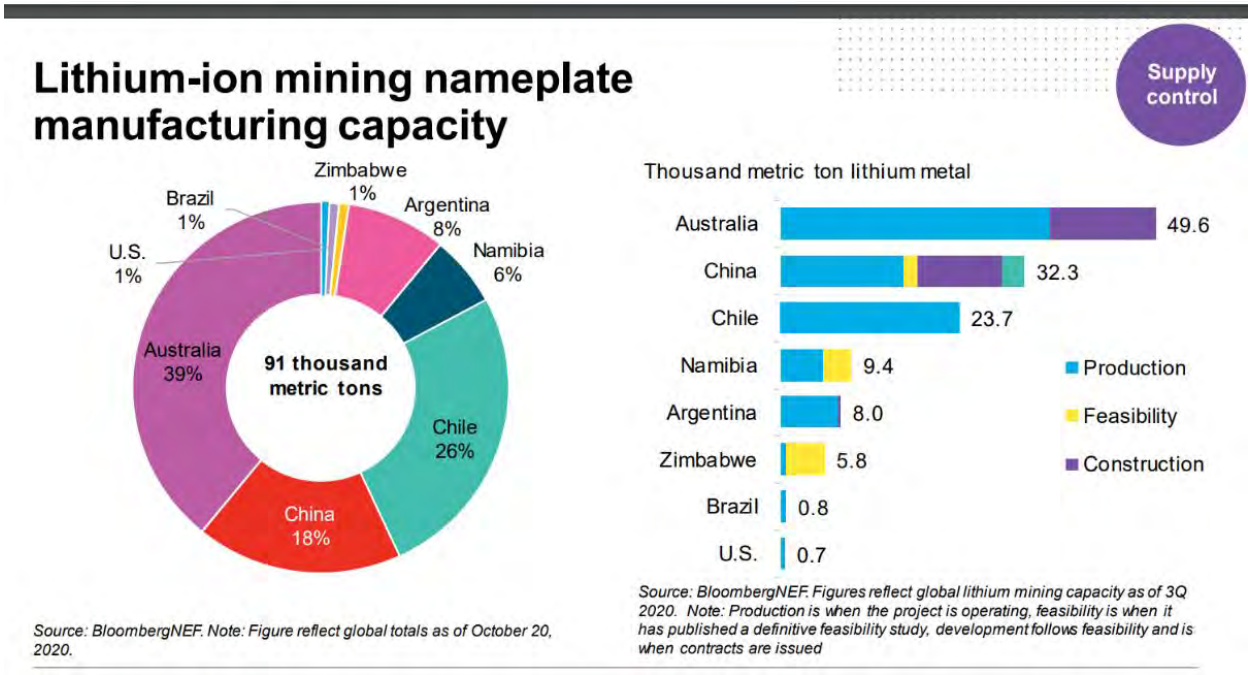
62 U.S. Geological Survey. 2021. *Mineral Commodities Summaries 2021*. U.S. Geological Survey. https://pubs.usgs.gov/periodicals/mcs2021/mcs2021.pdf.

63 Blue Ribbon Commission. 2022. "Transcript of the June 16, 2022, Blue Ribbon Commission meeting." Page 102. https://efiling.energy.ca.gov/GetDocument.aspx?tn=243846&DocumentContentId=77784.

64 U.S. Geological Survey. 2022. "Mineral Commodity Summaries 2022 — Lithium." U.S. Geological Survey. https://pubs.usgs.gov/periodicals/mcs2022/mcs2022-lithium.pdf.

65 Figure 4 shows metric tons of lithium (Li). Lithium carbonate equivalent is often used as a standard unit to easily compare across different lithium products. To convert metric tons of lithium (Li) to metric tons of lithium carbonate, multiply each metric ton of lithium (Li) by 5.32. Applying this conversion factor, 91,000 metric tons of lithium (Li) is less than 500,000 metric tons of lithium carbonate equivalent.

Figure 4: Global Lithium Mining and Recovery Capacity (Third Quarter 2020)



Source: BloombergNEF[66]

Hard Rock Mining and Evaporation Ponds

Hard rock mining and evaporation ponds are used in other places to extract lithium but are not proposed for use in recovering lithium from the brine used in geothermal power plants in Imperial County.

More than half of all lithium recovered globally, comes from hard rock mining, most of which occurs in Western Australia and China. Hard rock mining essentially follows a traditional mining process that uses heavy equipment to remove soil and rock to find lithium-rich deposits within hard rock.[67] The mining is then followed by additional physical and chemical processing to make lithium products that are sold to product manufacturers.[68] Nature Conservancy noted in their August 2022 report, *Potential Lithium Extraction in the United States: Environmental, Economic, and Policy Implications* that, "Lithium mined from hard rock and clay may result in impacts that are well-documented for strip mining and open-pit mining, including physical disturbance of soils and vegetation (Kosai et al. 2020);[69] air emissions and deposition

66 Logan Goldie-Scot (BNEF). 2021. Global Lithium Update. "Presentation for March 25, 2021, Blue Ribbon Commission meeting." https://efiling.energy.ca.gov/GetDocument.aspx?tn=237359&DocumentContentId=70545.

67 This processes generally involves drilling and blasting into hard rock areas to mine the rock (spodumene) then the ore is sorted, crushed, ground, separated, then washed, filtered, and dried to produce a spodumene concentrate.

68 Warren, Ian. 2021. *Techno-Economic Analysis of Lithium Extraction from Geothermal Brines*. National Renewable Energy Laboratory. NREL/TP-5700-79178. Page 3. https://www.nrel.gov/docs/fy21osti/79178.pdf.

69 Kosai, S., U. Takata and E Yamasue. 2021. "Natural Resource use of a Traction Lithium-ion Battery Production Based on Land Disturbances through Mining Activities." *Journal of Cleaner Production*, 280, 124871. As cited by Nature Conservancy. https://doi.org/10.1016/j.jclepro.2020.124871.

(Rodrigues et al. 2019);[70] stream sedimentation; potential contamination of soils, sediments, and ground and surface waters (Kaunda 2020);[71] and groundwater and surface water depletion (Schomberg et al. 2021)."[72]

The largest hard rock mining operation in the world is the Greenbushes mine in Western Australia (Figure 5), which has a capacity to supply 1.27 million tons of lithium per year. This mine is expanding to add another 800,000 tons per year capacity and additional expansion is being considered.[73]

Figure 5: Hard Rock Lithium Ore Mine in Greenbushes, Australia

Photo credit: Albermarle[74]

Almost all other lithium is recovered from salar brines through evaporation ponds, particularly in the "Lithium Triangle" countries of Argentina, Bolivia, and Chile. Lithium is produced by drilling wells into underground reservoirs and pumping brine into large open pond areas on the surface where it is exposed to the sun. As water evaporates, other minerals and contaminants

70 Rodrigues, P. M., Antão, A. M., & Rodrigues, R. 2019. "Evaluation of the Impact of Lithium Exploitation at the C57 Mine (Gonçalo, Portugal) on Water, Soil and Air Quality." *Environmental Earth Sciences*, 78(17), 1-14. As cited by The Nature Conservancy. https://doi.org/10.1007/s12665-019-8541-4.

71 Kaunda, R. B. 2020. "Potential Environmental Impacts of Lithium Mining." *Journal of Energy & Natural Resources Law*, 38(3), 237–244. As cited by The Nature Conservancy. https://doi.org/10.1080/02646811.2020.1754596.

72 Schomberg, A. C., S. Bringezu, and M. Flörke. 2021. "Extended Life Cycle Assessment Reveals the Spatially-explicit Water Scarcity Footprint of a Lithium-ion Battery Storage." *Communications Earth & Environment*, 2(1), 1-10. As cited by The Nature Conservancy. https://doi.org/10.1038/s43247-020-00080-9.

73 Macmillan, Angus. May 6, 2022. "Australia's Greenbushes Mine Expands Lithium Capacity." News article. *Argus Media Group*. https://www.argusmedia.com/en/news/2328828-australias-greenbushes-mine-expands-lithium-capacity.

74 Photo credit: Albemarle. As cited in Treadgold, Tim. 2016. "Window Opens for Lithium Hopefuls." *Businessnews*. https://www.businessnews.com.au/article/Window-opens-for-lithium-hopefuls.

are typically removed until a concentrated solution of lithium chloride remains, which is pumped to facilities for further processing to develop the desired lithium compounds. The process can take months or years, is water-intensive and can require thousands of square miles of land. Figure 6 shows lithium evaporation ponds in San Pedro de Atacama, Chile. [75,76]

Figure 6: Lithium Evaporation Ponds in San Pedro de Atacama, Chile

Source: Sociedad Quimica Mineral de Chile

As discussed in detail in Chapter 4 of this report, extracting lithium using DLE technologies proposed for use in Imperial County is designed to be a more sustainable and environmentally superior approach as compared to methods predominantly used in other places.

Direct Lithium Extraction (DLE) Technologies

DLE is the process of recovering lithium from brine, typically using engineered material such as sorbents or something that attracts lithium ions.[77] DLE technologies are grouped into three main types: adsorption, ion exchange, or solvent extraction.[78] In Imperial County, EnergySource Minerals, CTR, and BHE Renewables are planning to develop DLE facilities. Each of these projects, described in more detail later in this report, is being designed to recover lithium from geothermal brine after it moves through pipelines and tanks at a geothermal

75 Lineen, N., R. Bhave, and D. Woerner. 2018. "Purification of Industrial Grade Lithium Chloride for the Recovery of High Purity Battery Grade Lithium Carbonate." *Separation and Purification Technology*, 214, 168-173. https://doi.org/10.1016/j.seppur.2018.05.020.

76 Bradley, D.C., L.L. Stillings, B.W. Jaskula, L. Munk, and A.D. McCauley. 2017. "Lithium: Chapter K of Critical Mineral Resources of the United States — Economic and Environmental Geology and Prospects for Future Supply." *U.S. Geological Survey*, Professional Paper 1802-K. https://pubs.usgs.gov/pp/1802/k/pp1802k.pdf.

77 A *sorbent* is a solid material used to isolate liquids or gases. Sorbents such as aluminum hydroxide are used in direct lithium extraction to separate lithium from geothermal brine.

78 Warren, Ian. 2021. "Techno-Economic Analysis of Lithium Extraction from Geothermal Brines." *National Renewable Energy Laboratory*. NREL/TP-5700-79178. https://www.nrel.gov/docs/fy21osti/79178.pdf.

power plant.[79] The DLE facilities currently proposed in Imperial County will not use evaporation ponds or hard rock mining.

This report generally refers to hard rock mining and evaporation ponds as *extraction*, and DLE as recovery to distinguish DLE from the unsustainable and environmentally harmful processes.

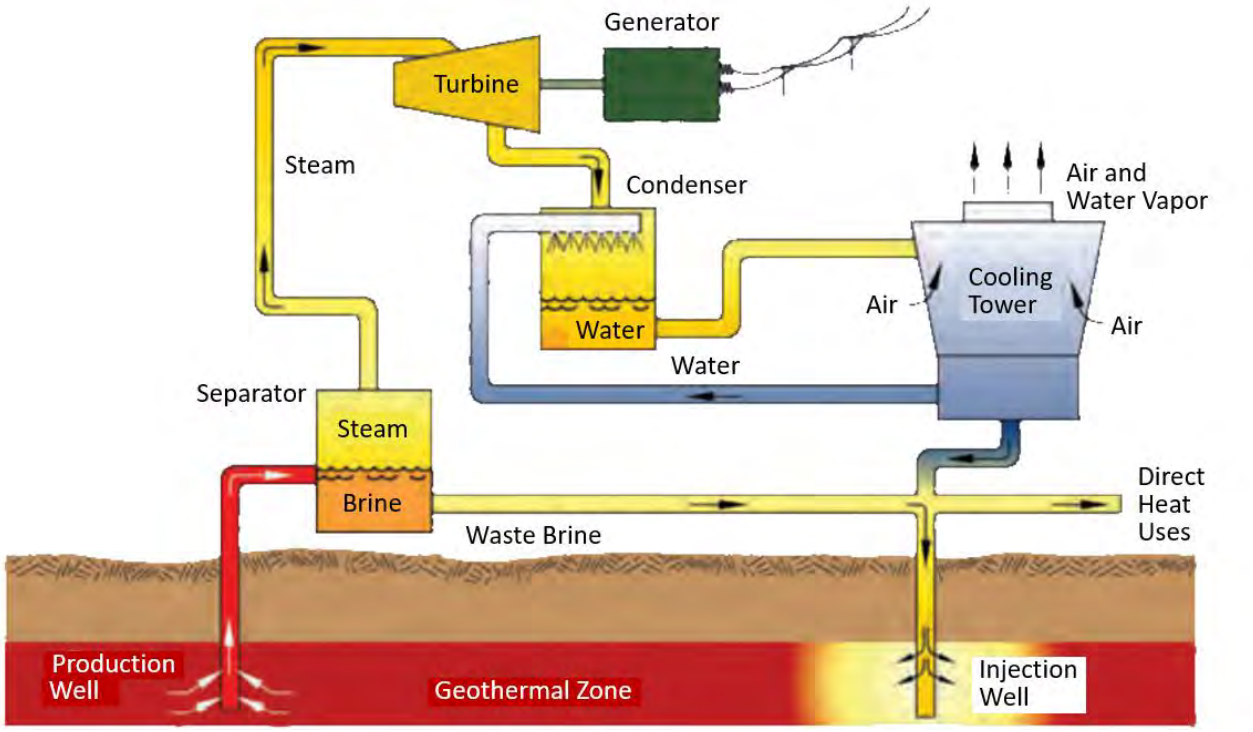
A DLE system can be added to an existing geothermal power plant or built into the design of a new geothermal power plant. Geothermal power plants produce electricity from the heated fluid in a geothermal reservoir that is brought to the surface. The Earth's internal thermal energy is extracted as heated steam or brine and used to heat water or another working fluid to turn a turbine of a generator, producing electrical power. When geothermal power plants and lithium recovery facilities are colocated, recovery of lithium chloride from geothermal brines can take advantage of on-site renewable power generated by the geothermal power plants, as well as the brine handling and treatment equipment.[80]

As shown in Figure 7, flash steam geothermal power plants, like the geothermal power plants in the Salton Sea KGRA, use a multistep process that begins with drilling production wells deep into an underground geothermal reservoir to flow a mixture of steam and hot brine to the surface under high pressure. When the brine reaches the surface, the pressure is dropped, producing more steam, which drives a turbine connected to a generator to produce electricity. The steam and brine are then cooled and moved to an injection well, which pumps the brine back into the geothermal reservoir, where it is naturally reheated.

79 Blue Ribbon Commission. 2021. "Presentation at the Blue Ribbon Commission Meeting of July 29, 2021." Slides 43-45. https://efiling.energy.ca.gov/GetDocument.aspx?tn=239214&DocumentContentId=72666.

80 Blue Ribbon Commission. 2021. "Transcript of the August 26, 2021, Blue Ribbon Commission Meeting." Page 105. https://efiling.energy.ca.gov/GetDocument.aspx?tn=240014&DocumentContentId=73462.

Figure 7: Flash Steam Geothermal Power Plant



Source: U.S. Department of Energy[81]

As noted above, DLE technologies are designed to recover lithium and other minerals as the geothermal brine flows through pipelines and tanks and over a surface or substance that removes the lithium and other minerals before returning the brine deep underground.[82, 83]

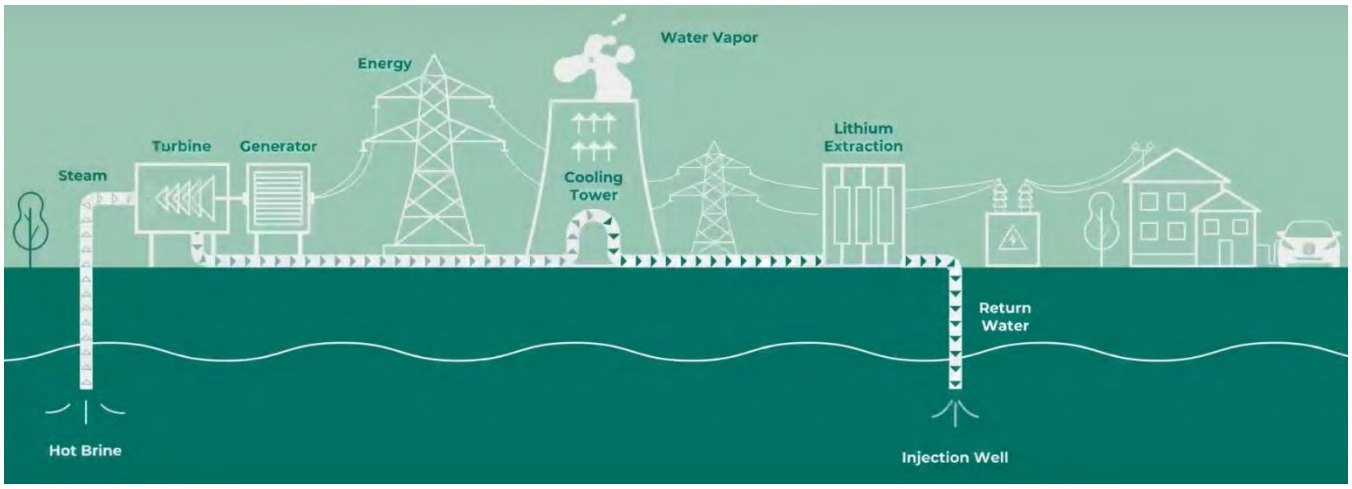
As an example, Figure 8 shows a diagram of the EnergySource Minerals Project ATLiS, which is under construction to add a DLE facility to an existing geothermal power plant. The geothermal brine will move through pipelines to the DLE facility before it enters the injection well and is pumped back to the underground geothermal reservoir.

81 U.S. Department of Energy. 2010. *A History of Geothermal Energy Research and Development in the United States. Energy Conversion 1976-2006*.
https://www.energy.gov/sites/prod/files/2014/02/f7/geothermal_history_4_conversion.pdf.

82 Blue Ribbon Commission. 2022. Discussion and Presentations by Derek Benson (EnergySource Minerals), Mike McKibben (UC Riverside), and Jim Turner (Controlled Thermal Resources). In "Transcript of June 16, 2022, Meeting." CEC Docket 20-LITHIUM-01 TN#: 243846.
https://efiling.energy.ca.gov/GetDocument.aspx?tn=243846&DocumentContentId=77784.

83 Blue Ribbon Commission. 2022. "Transcript of the June 30, 2022, Blue Ribbon Commission Meeting."
https://efiling.energy.ca.gov/GetDocument.aspx?tn=244229&DocumentContentId=78154.

Figure 8: Illustration of the EnergySource Minerals Project ATLiS



Source: EnergySource Minerals, https://www.esminerals.com/iliad.

Proposed Use of DLE Technologies in the Salton Sea KGRA

This section discusses the location, potential for additional geothermal power plant capacity, and the estimated amount of lithium in the Salton Sea KGRA.

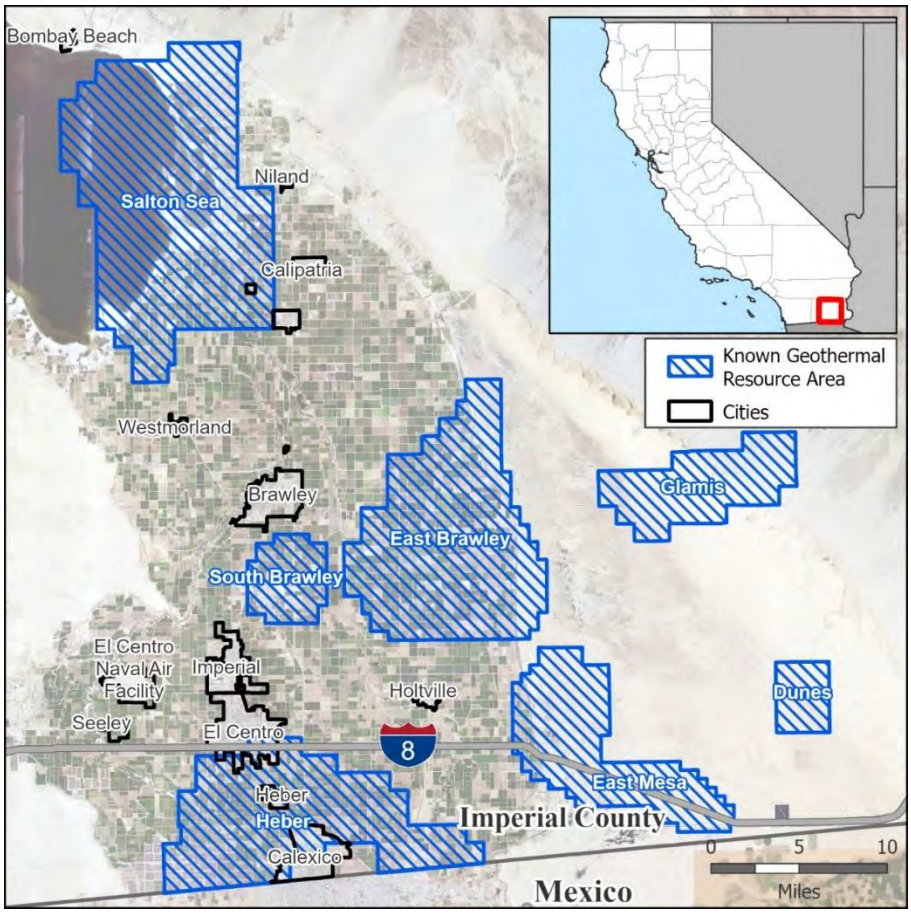
Salton Sea Known Geothermal Resource Area

The "Geothermal Steam Act of 1970" directed the Secretary of the Interior to designate, in summary, areas known to have geothermal resource potential as "known geothermal resource areas", or "KGRAs".[84] KGRAs are typically given a specific name. According to CEC and as shown in Figure 9, there are 20 KGRAs in California, with 7 in the Imperial Valley region.[85] At first glance, Figure 9 appears to show that the Salton Sea and the KGRA intersect or overlap, but in reality, the KGRA is far below the floor of the Salton Sea. The geothermal reservoir starts at 1,500 feet underground and the depth where geothermal wells draw fluid is typically between 0.5 and 2 miles below ground level.

84 "Geothermal Resources." 30 U.S.C. section 1001 (e). https://www.govinfo.gov/content/pkg/USCODE-2017-title30/html/USCODE-2017-title30-chap23.htm.

85 California Energy Commission. January 23, 2022. "Known Geothermal Resource Areas (California, 2020)." Accessed November 29, 2022. https://cecgis-caenergy.opendata.arcgis.com/documents/CAEnergy::known-geothermal-resource-areas/explore.

Figure 9: Known Geothermal Resource Areas in Imperial County, California[86]



Source: California Energy Commission staff based on data from California Department of Conservation, Geologic Energy Management Division (CalGEM, formerly DOGGR) from 2002

Focusing on the Salton Sea KGRA, according to CEC data, there are currently 11 geothermal power plants producing electricity from the geothermal brine in the Salton Sea KGRA with an installed nameplate capacity for these facilities of approximately 414 megawatts (MW).[87] Experts estimate the geothermal resource of the Salton Sea KGRA is robust enough to support development of between 2,330 and 2,950 MW of additional geothermal power plants, six (6) times the current installed capacity.[88, 89] Figure 10 shows the estimated location and

86 Sample(s) from the South Brawly KGRA also indicate a potential high concentration of lithium; however, the South Brawly KGRA is smaller, and the Salton Sea KGRA has the largest known lithium brine deposit and is the focus of proposed lithium development. McKibben, Michael (U.C. Riverside). 2021. "Presentation for the March 25, 2021, Blue Ribbon Commission Meeting." https://efiling.energy.ca.gov/GetDocument.aspx?tn=237359&DocumentContentId=70545.

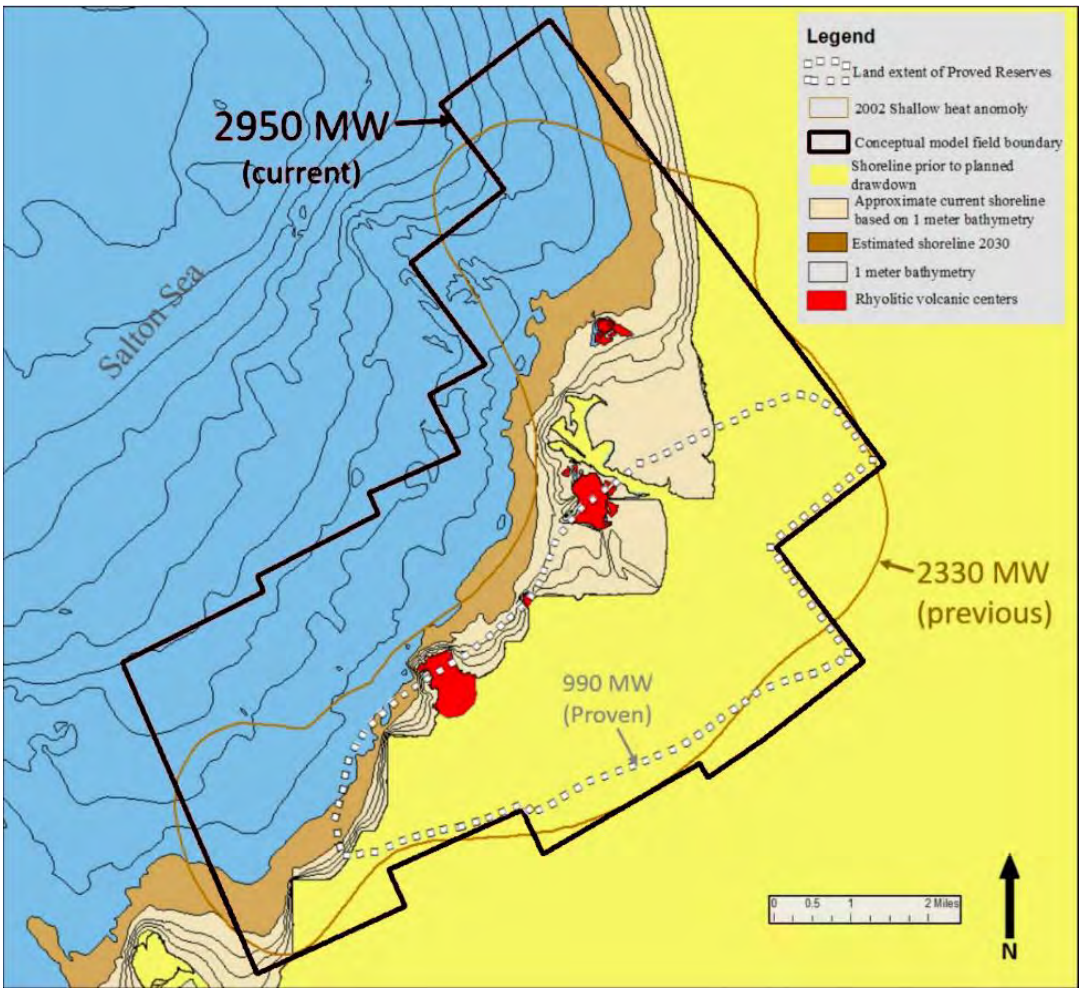
87 California Energy Commission. "Known Geothermal Resource Areas (California, 2020)." Accessed November 29, 2022. https://cecgis-caenergy.opendata.arcgis.com/documents/CAEnergy::known-geothermal-resource-areas/explore.

88 Kaspereit, Dennis, Mary Mann, Subir Sanyal, Bill Rickard, William Osborn, and Jeff Hulen. 2016. "Updated Conceptual Model and Reserve Estimate for the Salton Sea Geothermal Field, Imperial Valley, California." GRC Transactions, Vol. 40.

89 California Energy Commission. 2021. "Presentation for the March 25, 2021, Blue Ribbon Commission Meeting." Slide 56. https://efiling.energy.ca.gov/getdocument.aspx?tn=237359.

geothermal power potential of the Salton Sea KGRA. As noted previously and shown on this map, a portion of the KGRA lies deep underground under the existing footprint of the Salton Sea.

Figure 10: Salton Sea KGRA[90]



Source: Kaspereit et al. 2016.[91]

The amount of lithium in each KGRA also varies as each geothermal reservoir has a unique depth, temperature, and composition. In the Salton Sea KGRA, the brine is rich in many minerals including manganese, zinc, and lithium. It is conservatively estimated that there are 2 million metric tons of lithium available in the reservoir at a depth of up to 1.2 miles deep from

90 "Planned drawdown" refers to implementation of a 2003 water transfer agreement. The impact of the 2003 water transfer agreement is the basis for the estimated shoreline in 2030. IID provides additional information on the current and projected shoreline of the Salton Sea in "Graphic Representation of the QSA Water Transfer on the Salton Sea," available from https://www.iid.com/water/salton-sea.

91 Kaspereit, Dennis, Mary Mann, Subir Sanyal, Bill Rickard, William Osborn, and Jeff Hulen. 2016. "Updated Conceptual Model and Reserve Estimate for the Salton Sea Geothermal Field, Imperial Valley, California." *Geothermal Res. Council Transactions* 40, 57-66. https://publications.mygeoenergynow.org/grc/1032308.pdf.

ground level,[92] with a reasonable expectation that the amount is at least three times higher.[93] A CEC funded research project conducted by SRI International, found that the Salton Sea KGRA can produce more than 600,000 tons per year of lithium carbonate equivalent (LCE) if fully developed.[94] Since DLE technologies for the recovery of lithium from geothermal brine rely on a geothermal power plant to bring the brine to the surface, the amount of lithium recovered corresponds to the amount of brine flowing through the power plants. Some estimates indicate that Current geothermal power capacity at the Salton Sea KGRA is able to support recovery of roughly 127,000 metric tons of LCE.[95,96] For comparison, global production of lithium primarily through mining and evaporation ponds in 2020 was less than 500,000 tons LCE but is expected to increase significantly.[97] Current and projected markets for lithium are discussed in more detail later in Chapter 4.

A current project among Lawrence Berkeley National Laboratory (Berkeley Lab), UC Riverside, and Geologica Geothermal Group, Inc. seeks to better quantify and characterize the quantity of lithium in the Salton Sea KGRA.[98]

92 McKibben, M.A., W. A. Elders, and A.S.K Raju. 2020. "Lithium and Other Geothermal Mineral and Energy Resources beneath the Salton Sea." Chapter 7. In *Crisis at the Salton Sea: Research Gaps and Opportunities*. University of California, Riverside Salton Sea Task Force. (pre-publication). Page 112. https://www.researchgate.net/publication/346088705_Lithium_and_other_geothermal_mineral_and_energy_resources_beneath_the_Salton_Sea.

93 Blue Ribbon Commission. 2021. "Transcript of the March 25, 2021, Blue Ribbon Commission Meeting." Pages 107-108. https://efiling.energy.ca.gov/GetDocument.aspx?tn=237478&DocumentContentId=70677.

94 Ventura, Susanna, Srinivas Bhamidi, Marc Hornbostel, Anoop Nagar. 2020. *Selective Recovery of Lithium from Geothermal Brines*. California Energy Commission. Publication Number: CEC-500-2020-020. https://www.energy.ca.gov/sites/default/files/2021-05/CEC-500-2020-020.pdf.

95 Warren, Ian. 2021. *Techno-Economic Analysis of Lithium Extraction from Geothermal Brines*. National Renewable Energy Laboratory. NREL/TP-5700-79178. https://www.nrel.gov/docs/fy21osti/79178.pdf.

96 LCE is the industry standard used for comparison of quantities since lithium can be produced in a number of forms, including lithium carbonate and lithium hydroxide.

97 Logan Goldie-Scot (BloombergNEF). March 25, 2021. Global Lithium Update. Presentation. Blue Ribbon Commission Meeting. https://efiling.energy.ca.gov/GetDocument.aspx?tn=237359&DocumentContentId=70545.

98 U.S. Department of Energy, Geothermal Technologies Office. February 28, 2022. "GTO Funds Berkeley Lab in Partnership with UC Riverside to Assess and Characterize Lithium Resources." Press Release. https://www.energy.gov/eere/geothermal/articles/gto-funds-berkeley-lab-partnership-uc-riverside-assess-and-characterize.

Current Proposals for Imperial County DLE Facilities

Three developers (EnergySource Minerals, BHE Renewables, and CTR) are in the process of developing projects to recover lithium from geothermal brine at existing or new geothermal power plants in Imperial County using DLE technologies.[99]

EnergySource Minerals Project ATLiS.[100] According to EnergySource Minerals, the project is a "development initiative to extract and produce battery-spec lithium products utilizing geothermal brines from the Salton Sea geothermal resource area." The lithium recovery project is currently anticipating the start of construction at the existing John L. Featherstone Plant in Calipatria, California in quarter 4 of 2022, with commercial operations scheduled to begin in 2024. The facility anticipates production of 17,600 metric tons per year of LCE. The project received a use permit from Imperial County in 2021,[101] after the County certified an EIR prepared to meet the requirements of the California Environmental Quality Act (CEQA).[102]

BHE Renewables Demonstration Projects.[103, 104] BHE Renewables started operation of a lithium recovery demonstration project at one of their 10 geothermal power plants on the Salton Sea KGRA in the second quarter of 2022. The project will demonstrate the recovery of lithium[105] from geothermal brine as one step in the company's plans to develop commercial scale facilities. This demonstration project is receiving support from a CEC grant[106] and was found to be exempt from CEQA. BHE Renewables is also in the process of developing another demonstration project[107] to process lithium chloride into battery-grade lithium compounds and

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99 BHE Renewables is one of a family of companies and a subsidiary of Berkshire Hathaway Energy. BHE Renewables is also generally used to refer to BHE Renewables, LLC, and its subsidiaries. The names of some of these related entities have changed over time. BHE Renewables' geothermal facilities in Imperial County previously operated as CalEnergy Operations, or CalEnergy.

100 EnergySource Minerals. "Project ATLiS." Accessed November 29, 2022. https://www.esminerals.com/atlis.

101 Imperial County, Planning & Development Services Department. 2021. "Project Report." https://www.icpds.com/assets/hearings/environmental-evaluation-committee/202101141330-regular-meeting/2.-CUP-20-0008-ENERGY-SOURCE-MINERALS.pdf. https://www.icpds.com/assets/hearings/02.-WSA,FIER,-MMRP,-CUP20-0008,-PM02485-Energy-Source-Mineral-ATLiS-PC-Pkg.pdf.

102 The laws and rules governing the CEQA process are contained in the CEQA statute (Public Resources Code Section 21000 and following), the CEQA Guidelines (California Code of Regulations, Title 14, Section 15000 and following), published court decisions interpreting CEQA, and locally adopted CEQA procedures.

103 BHE Renewables. "BHE Renewables: Geothermal." Webpage. Accessed November 29, 2022. https://www.bherenewables.com/projects/geothermal.

104 BHE Renewables is one of a family of companies including BHER Minerals, LLC which is the official recipient of the CEC grant. CalEnergy is the former name of the BHE Renewables entity operating the geothermal facilities and this name appears in certain permitting and CEQA documents.

105 In the form of lithium chloride.

106 California Energy Commission staff. 2020. "Grant Request Form: EPC-19-020." California Energy Commission. Publication Number: EPC-19-020. https://www.energy.ca.gov/filebrowser/download/293. Also, see California Energy Commission. 2020. "Notice of Exemption: BHER Minerals, LLC Salton Sea Geothermal Lithium Recovery Demonstration Project." https://ceqanet.opr.ca.gov/2020060332/2.

107 County of Imperial, Planning & Development Services. 2021. "Notice of Exemption: BHER Minerals, LLC Cal Energy Region 1 Lithium Hydroxide Pilot Test." https://www.icpds.com/assets/planning/notices/2021/IS21-0018-Cal-Energy-Notice-of-Exemption-09-03-21.pdf.

anticipates this second demonstration project could be operational in 2023.[108] BHE Renewables is further exploring the development of 377 MW net of additional geothermal power capacity in Imperial County.

CTR Hell's Kitchen PowerCo1 and LithiumCo1 Project.[109] CTR is planning and completing engineering and permitting for a proposed new 49.9 MW geothermal power plant with a colocated minerals recovery and processing facility near the eastern shore of the Salton Sea in Imperial County approximately 3.6 miles west of the town of Niland. CTR anticipates power production will be operational in late 2023 and lithium production in 2024. CTR plans for future project phases to increase power generation and lithium recovery. CTR, through project subsidiaries, submitted applications to Imperial County in December 2021 for conditional use permits for PowerCo1 and LithiumCo1 Projects. The permit applications are currently under review and CEQA processes for the combined project including both applications are being completed by the Imperial County Planning & Development Services Department.[110]

Figure 11 shows the locations of the projects in proximity to one another,[111] as well as to other existing geothermal power plants, the "fenceline" communities of Calipatria and Niland, and to other communities in the Salton Sea region. Again, while the Salton Sea is a dominant water feature in this map, it is important to note that the Salton Sea KGRA – which is the source of geothermal brine for geothermal power and lithium recovery – lies deep underground and is not connected physically to the Salton Sea.[112] The common misperception that the two are connected, due in part to the common naming, has been a point of confusion for many people.

108 Blue Ribbon Commission. 2022. "Transcript of June 30, 2022, Blue Ribbon Commission Meeting." Page 15. https://efiling.energy.ca.gov/GetDocument.aspx?tn=244229&DocumentContentId=78154.

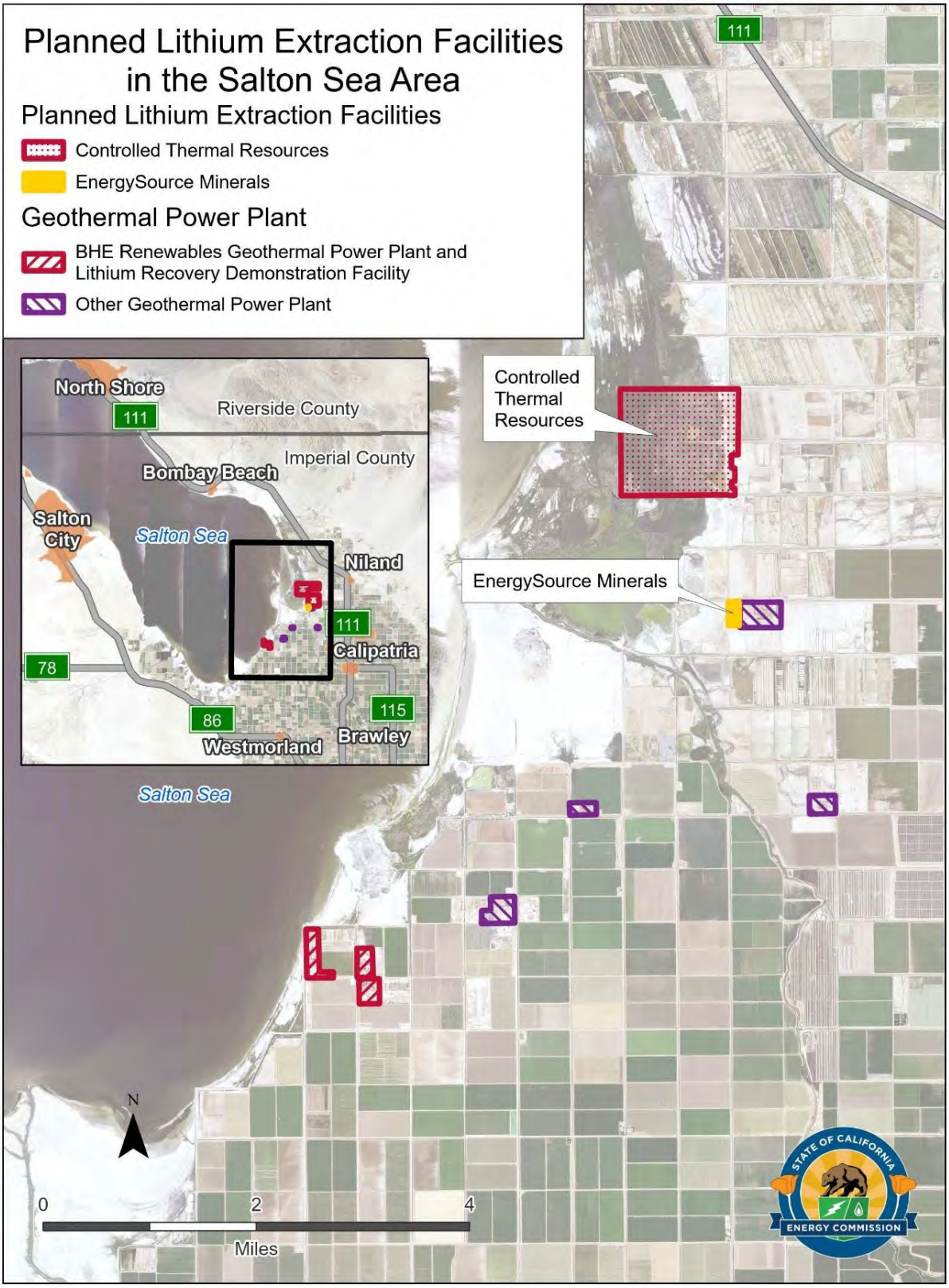
109 Controlled Thermal Resources. Website. https://www.cthermal.com/.

110 Imperial County, Planning & Development Services Department. 2022. "Notice of Preparation of Draft EIR for Hell's Kitchen Powerco 1 and Lithiumco 1 Project and Notice of Public EIR Scoping Meeting." https://www.icpds.com/assets/Notice-of-Preparation-1648825659.pdf.

111 For information on geothermal leases on lands managed by the California State Lands Commission, see California State Lands Commission. 2022. "Geothermal Energy: Lease Portfolio." https://www.slc.ca.gov/renewable-energy/geothermal-energy/.

112 Blue Ribbon Commission. 2021. "Transcript of the November 17, 2021, Blue Ribbon Commission Meeting Community Forum." Pages 118, 132-133, 140. https://efiling.energy.ca.gov/GetDocument.aspx?tn=240766&DocumentContentId=74208.

Figure 11: Current Geothermal Power Plants and Proposed Locations of Facilities to Recover Lithium from Geothermal Brine in Imperial County



Source: CEC staff, EnergySource, CTR, and BHE Renewables

While Figure 11 identifies the general location of the projects that are under construction or planned at this time, it does not fully display the broader area that will be impacted by the anticipated development of economic activity anchored in sustainable geothermal power production and lithium recovery in the Salton Sea KGRA.

The next chapter summarizes perspectives from communities and Tribes regarding the plans for DLE facilities and geothermal power plants in Imperial County.

CHAPTER 3:
Community and Tribal Priorities and Perspectives

This chapter provides context for, and discussion of, community and Tribal perspectives shared with the Blue Ribbon Commission to guide federal, state, and local efforts focused on the development of "Lithium Valley".

Regional Background: Existing Socioeconomic and Environmental Factors

For the purposes of this report, the Salton Sea region includes all of Imperial County and Eastern Coachella Valley in Riverside County, extending from the city of Coachella and unincorporated communities near the Salton Sea, and then farther east to the California-Arizona border.[113] About 150,000 people live and work in its communities. Major employment sectors across the area include agriculture and tourism.[114] The Salton Sea region is a leading area for California renewable energy production, especially solar and geothermal energy.[115]

The region is a desert characterized by high temperatures and low average rainfall. However, the economy is heavily based on agriculture due to the long history of agricultural development, robust irrigation systems, and mild winter weather.[116, 117] As noted previously, the region also faces some of the most severe economic challenges in the state. Median household income in Imperial County is roughly 60 percent of the statewide average with 18.1 percent of Imperial County residents living in poverty.[118] The unemployment rate in Imperial County is the highest of any county in California and more than three times higher than the state average.[119] Education and language data indicates additional barriers for residents with a

113 Blue Ribbon Commission. 2022. "Final Letter Regarding Community Economic Resilience Fund (CERF) Recommendations for Salton Sea Region." https://efiling.energy.ca.gov/GetDocument.aspx?tn=242292&DocumentContentId=75794.

114 Blue Ribbon Commission. 2022. "Final Letter Regarding Community Economic Resilience Fund (CERF) Recommendations for Salton Sea Region." https://efiling.energy.ca.gov/GetDocument.aspx?tn=242292&DocumentContentId=75794.

115 California Energy Commission. 2019. "Utility-Scale Renewable Electrical Generation Totals by County." Accessed November 29, 2022. https://cecgis-caenergy.opendata.arcgis.com/documents/CAEnergy::utility-scale-renewable-electrical-generation-totals-by-county/explore.

116 Coachella Valley Resource Conservation District. "Coachella Valley." Accessed August 2, 2022. https://www.cvrcd.com/coachella-valley.

117 Imperial County. 2021. "Economic Contributions of Imperial County Agriculture." https://agcom.imperialcounty.org/wp-content/uploads/2021/08/2021-Economic-Contribution-of-Imperial-County-Ag.pdf.

118 U.S. Census Bureau. "QuickFacts: Imperial County, California." Accessed November 29, 2022. https://www.census.gov/quickfacts/fact/table/imperialcountycalifornia/PST045219. Also, U.S. Census Bureau, *QuickFacts: California*. Accessed November 29, 2022. https://www.census.gov/quickfacts/CA.

119 State of California. 2022. "Monthly Labor Force Data for Counties (July 2022)." Employment Development Department of the Labor Market Information Division. Report 400 C. https://www.labormarketinfo.edd.ca.gov/file/lfmonth/2207rcou.pdf.

high percentage of households primarily non-English speaking and high rates of adults without a high school education.[120] As described in other areas of this report, infrastructure further complicates daily life and career opportunities as the region has large areas without public transportation or broadband access and low rates of computer ownership.[121] [122, 123]

Much has been written about the physical history of the Salton Sea region, and the report of the state's Legislative Analyst's Office, *The Salton Sea: A Status Update*, dated August 2018, provides a comprehensive discussion of the Salton Sea and conditions that affect the surrounding communities and broader region.[124] According to this report, the Salton Sea is California's largest inland lake, located in Riverside and Imperial Counties, with a surface area roughly twice that of Lake Tahoe.[125]

The Salton Sea sits east of Anza Borrego Desert State Park and about 40 miles north of the border with Mexico. The sea lies more than 200 feet below sea level within the boundaries of ancient Lake Cahuilla.[126] Throughout history, the Salton Sea has intermittently filled and dried. An accidental event in 1905 sent large amounts of water from the Colorado River into the lakebed area for two years, creating high water levels attracting outdoor recreation enthusiasts.[127, 128] The Salton Sea was once a rich site of marine life and also provided critical food, rest, and nesting habitat for at least 270 to, according to some sources, as many as 400 bird species, including threatened and endangered species.[129, 130] However the current lake

120 U.S. Census Bureau. "QuickFacts: Imperial County, California." Accessed November 29, 2022. https://www.census.gov/quickfacts/fact/table/imperialcountycalifornia/PST045219.

121 Blue Ribbon Commission. 2022. "Transcript from July 21, 2022, Blue Ribbon Commission Meeting." https://efiling.energy.ca.gov/GetDocument.aspx?tn=245784&DocumentContentId=79989.

122 U.S. Census Bureau. "QuickFacts: Imperial County, California." Accessed November 29, 2022. https://www.census.gov/quickfacts/fact/table/imperialcountycalifornia/PST045219.

123 CA Public Utilities Commission. "CPUC Annual Collected Broadband Data." Data as of December 31, 2020. Accessed November 27, 2022. https://www.cpuc.ca.gov/industries-and-topics/internet-and-phone/broadband-mapping-program/cpuc-annual-collected-broadband-data.

124 Taylor, Mac (Legislative Analyst's Office). 2018. "Salton Sea: A Status Update." https://lao.ca.gov/reports/2018/3879/salton-sea-082918.pdf.

125 Taylor, Mac (Legislative Analyst's Office). 2018. "*Salton Sea: A Status Update."* https://lao.ca.gov/reports/2018/3879/salton-sea-082918.pdf.

126 Phukan, Anjali, Todd J. Braje, Thomas K. Rockwell, and Isaac Ullah. 2019. "Shorelines in the Desert: Mapping Fish Trap Features Along the Southwest Coast of Ancient Lake Cahuilla, California," *Advances in Archaeological Practice.* DOI: 10.1017/aap.2019.31. https://www.researchgate.net/publication/335752697_Shorelines_in_the_Desert_Mapping_Fish_Trap_Features_along_the_Southwest_Coast_of_Ancient_Lake_Cahuilla_California.

127 California State Parks. 2017. "Salton Sea State Recreation Area." https://www.parks.ca.gov/pages/639/files/SaltonSeaSRA_FinalWebLayout0501017.pdf.

128 The Salton Sea Authority. 2017. "Timeline of Salton Sea History." Accessed August 16, 2022. https://saltonseaauthority.org/get-informed/history/.

129 Taylor, Mac (Legislative Analyst's Office). 2018. *Salton Sea: A Status Update.* https://lao.ca.gov/reports/2018/3879/salton-sea-082918.pdf.

130 Jones, A., D. Orr, and D. Cooper. 2019. *The Status of Birds at the Salton Sea*. National Audubon Society. New York, NY. USA. https://ca.audubon.org/sites/default/files/salton_sea_bird_status_042419_final.pdf.

conditions are dramatically different than the lake that drew tourists and wildlife in earlier decades.

The Imperial Irrigation District (IID) notes that due to evaporation and decreased inflows of water, the Salton Sea has been shrinking.[131] And according to the California Natural Resources Agency, the Salton Sea has become significantly more saline, leading to negative impacts on people and wildlife.[132] As the lake decreases, areas previously covered with water become exposed. When high winds blow over these areas, airborne dust levels reach unhealthy levels. The particulate matter in the dust can contain toxic elements due to decades of agricultural runoff[133] and particulate matter that can become trapped in the lungs and cause asthma attacks, bronchitis, and lung diseases. Concerned about the increasing salinity of the Salton Sea, experts have called for additional research and monitoring of potential ecological and public health impacts.[134]

Public health experts and community representatives provided the Blue Ribbon Commission with information on the existing exposures and poor health indicators in the Coachella and Imperial Valleys noting historically poor health outcomes and high rates of emergency department visits due to asthma and other air pollution-related conditions.[135] Additional data sources provide further documentation of these conditions. Referring to data and statistics for Imperial County, which are used in this report as representative of the overall region, the rates of hospitalization have been 50 — 100 percent higher for asthma in the area compared to statewide averages.[136] As noted in this report, many of the census tracts in the area are identified by California Environmental Protection Agency's CalEnviroScreen as disproportionately burdened by multiple sources of pollution.[137]

As noted, the Salton Sea Management Program is constructing projects to address air quality and ecological threats from the declining amount of water in the Salton Sea. From 2018 to

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131 The Imperial Irrigation District prepared a Salton Sea animation video showing the amount and location of exposed areas (known as playa) previously covered by the Salton Sea. The amount of exposed play increased from 10,600 acres in 2012 to 34,700 acres in 2022 due to the transfer of conserved water to other Southern California water districts. Source: Imperial Irrigation District, "Graphic Representation of the Quantification Settlement Agreement (QSA) Water Transfer on the Salton Sea." Salton Sea Animation Video. Available from Imperial Irrigation District. "Salton Sea." Accessed November 29, 2022. https://www.iid.com/water/salton-sea.

132 California Natural Resources Agency. 2021. *Updated Draft Salton Sea Management Program Phase 1: 10-Year Plan Project Description*. https://saltonsea.ca.gov/wp-content/uploads/2021/03/Updated-Draft-Salton-Sea-Management-Program-Phase-I-10-Year-Plan-Project-Description-March-2021.pdf.

133 Johnston JE, Razafy M, Lugo H, Olmedo L, Farzan SF. "The Disappearing Salton Sea: A Critical Reflection on the Emerging Environmental Threat of Disappearing Saline Lakes and Potential Impacts on Children's Health." *Sci Total Environ*. 2019 May 1;663:804-817. Epub 2019 Jan 29. PMID: 30738261; PMCID: PMC7232737. https://doi.org/10.1016/j.scitotenv.2019.01.365.

134 Bradley T., H. Ajami, and W. Porter. 2022. "Ecological Transitions at the Salton Sea: Past, Present and Future." *Calif. Agr.* 76(1):8-15. https://doi.org/10.3733/ca.2022a0004.

135 Blue Ribbon Commission. 2022. "Presentation for the March 24, 2022, Blue Ribbon Commission Meeting." https://efiling.energy.ca.gov/GetDocument.aspx?tn=242466.

136 Taylor, Mac (Legislative Analyst's Office). 2018. *Salton Sea: A Status Update.* https://lao.ca.gov/reports/2018/3879/salton-sea-082918.pdf.

137 Blue Ribbon Commission. 2022. March 24, 2022. Meeting Presentation. https://efiling.energy.ca.gov/GetDocument.aspx?tn=242466.

2028, the program plans to reduce health and ecological risks from 30,000 acres of exposed lakebed by creating habitat and building dust suppression projects in collaboration with landowners.[138]

Community Perspectives

Residents from throughout the region and representatives of community-based organizations participated in the proceedings of the Blue Ribbon Commission and provided input that informed the development of this report. Throughout the report, community input is incorporated in the information, findings and recommendations. This section, however, provides an overarching summary of the Blue Ribbon Commission's outreach and engagement learnings.

The Blue Ribbon Commission learned a great deal about ways that the local communities wish to be meaningfully included in the permitting and consideration of geothermal power plants, lithium recovery projects, and the development of related manufacturing projects in the region. The Commission also heard consistent requests that state and local government agencies acknowledge historic, systemic, and disproportionate environmental harms — in forms of structural, procedural, distributional, and generational inequity — caused to and experienced by low-income communities and communities of color. It also heard requests to go beyond standard procedures and instead proactively work to increase community voice and address and decrease potential negative impacts to the communities and region.

There is no "one size fits all" method to reach local and regional residents and communities and provide meaningful opportunity for participation and engagement in decision-making. Factors such as culture, language, education, and trust must be considered. For example, in these communities, since residents have less access to computers or wide access to technology and information, information should be provided at in-person meetings that are held at times convenient for those that work and in languages and terms that are appropriate for the education level of the community. The Commission also received requests for early and continuous consultation so that community members learn about -- and can provide feedback on proposed projects and local decision making in a timely manner throughout the anticipated development of the region, from early project permitting through eventually decommissioning.

Several issues raised by community members — not in order of priority — include:

- The need for additional in-person community information and question-and-answer sessions in the communities throughout the Salton Sea region related to both the work of the Blue Ribbon Commission and state and local government decision-making.
- The need for informational material using accessible language, including simple terms and translated into languages widely used and customized for the residents near the planned projects.
- Pathways for community influence in project approval, specific to new DLE facilities and broader investment and development in the region.
- Consideration of the existing public health issues for residents and workers.

138 State of California. "Salton Sea Management Program." https://saltonsea.ca.gov/program/.

- Consideration of existing environmental issues, such as the shrinking of the Salton Sea and reductions in the water supply, as identified by IID, when evaluating the impacts of new development.
- Consideration of the communities' existing workforce and skills, and appropriate training opportunity to ensure that anticipated jobs benefit residents.
- Lack of information and skepticism of the oversight of potential impacts to public health, water, air, and land (including potential earthquakes).
- Lack of existing infrastructure in the region (roads, sidewalks, broadband, housing), and the need for local infrastructure investment to happen in advance of, or concurrent with, industrial and economic development in the region.
- Requests for information on potential worst-case scenarios (such as a burst geothermal brine pipe) and emergency response plans to limit negative impacts.
- Concerns of the battery life cycle and planning as to how used batteries will be handled as the number of EVs increases.
- Concern about access to education, workforce training, and career opportunities.
- Need for community cobenefit agreements to ensure the community rises along with the industry, as well as oversight and accountability to ensure funding is allocated to local priorities for community-grounded projects.
- Need for additional time for deliberation and discussion, and funding to support meaningful community and Tribal engagement around specific projects, longer-term planning and development, and the work of the Blue Ribbon Commission.
- Interest in defining Imperial County as Lithium Valley, in part, in an effort to ensure that local residents and fenceline communities in closest proximity to the projects directly benefit from the development and anticipated economic benefits.

Tribal Perspectives

The Blue Ribbon Commission also invited and heard from Tribes regarding their priorities and concerns related to development of lithium production in the region. Tribal representatives participated in public meetings and provided correspondence to the Commission (received in the docket). The July 21, 2022, public meeting offered a specific opportunity for Tribal perspectives to be presented. During this meeting, significant concern and questions were raised by Tribal representatives, which conveyed that their communities lack sufficient information to engage on the topic of lithium recovery and noted that additional information and improved Tribal consultation was necessary. Jesus Arguelles serving as the Torres Martinez Desert Cahuilla Indians Economic Development Director shared, "the impact of lithium recovery must be addressed more aggressively on how this actively will affect the cultural, economic, technological, health, and wellness, governance status and the fabric of surrounding communities."[139]

Issues identified by Tribal representatives during the July 21, 2022, meeting, and subsequent written and oral comments, not in order of priority and summarized, include:

- The historical lack of timely and accessible information on proposed development in the region, and specific to the proposed lithium production development, Tribal communities require more information presented in accessible formats.
- Requests for meaningful Tribal consultation related to geothermal power development, lithium extraction activities. And other topics of interest.
- Concern, and some opposition, from Tribal leaders, elders, representatives, and members regarding the impacts of the proposed lithium recovery projects near the Salton Sea due to the potential cumulative impacts to the environment and cultural landscapes.
- The need for complete identification and protection of sacred sites, cultural resources, including the cultural environment, that may be impacted by all proposed new development and consideration of cumulative impacts to cultural landscapes, such as Obsidian Butte. A 2010 document titled *Ethnographic Assessment of the Importance of Obsidian Butte to the Native American Community, Imperial County, California* was prepared for the CEC and contains pertinent findings and recommendations.[140]
- The need for additional and accessible information about potential negative impacts on public health, water, air, and land including potential earthquake activity provided in words and terms that are more understandable by the community.
- The importance of working to restore the balance of nature and preserving ecosystems.

139 Blue Ribbon Commission. 2022. "Transcript of July 21, 2022, Blue Ribbon Commission Meeting." https://efiling.energy.ca.gov/GetDocument.aspx?tn=245784&DocumentContentId=79989.

140 California Energy Commission. 2010. *Ethnographic Assessment of the Importance of Obsidian Butte to the Native American Community, Imperial County, California*. https://efiling.energy.ca.gov/GetDocument.aspx?tn=55719&DocumentContentId=50356.

- The need to address unanswered questions about state and local planning for the recycling of batteries to ensure a thoughtful approach to battery industry development that considers the cradle-to-cradle lifecycle.
- Consideration of a Tribal vision for regional planning or a more comprehensive plan for the Salton Sea region and establishment of a fund led by Tribes to finance sustainable development and infrastructure development. The fund should focus on Tribal needs and priorities, such as water, improved digital connectivity, respiratory health and diabetes management, businesses of tomorrow, modernized roads, and community recreational facilities.

Tribal members and representatives provided additional correspondence supporting Commission activities, outlining certain concerns, stating opposition to proposed development. The perspectives of Tribal governments and members may be best understood by reading the comments as they were submitted.[141]

141 Comment letters and meeting transcripts provided on the docket can be found here Lithium Valley Commission. "Docket Log." Docket: 20-LITHIUM-01. Accessed November 29, 2022. https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=20-LITHIUM-01.

CHAPTER 4:
AB 1657 Topic Areas: Discussion of Findings

As discussed above, to enable the state to better understand the opportunities and potential challenges of lithium recovery in California, AB 1657 tasked CEC to convene and establish the Blue Ribbon Commission on Lithium Extraction in California. The Commission was authorized to (1) review, investigate, and analyze eight pertinent topics relating to lithium extraction and use in California and (2) submit a report to the Legislature by October 1, 2022, documenting the Commission's findings and recommendations.

The Blue Ribbon Commission's findings are presented in this chapter on each of the following topics:

A. Actions that will support the further development of geothermal power that have the potential to provide the cobenefit of lithium recovery from existing and new geothermal facilities.
B. Market opportunities for lithium.
C. The potential benefits of, and added value to, existing and new geothermal facilities in areas that contain mineral-rich brines for the state, the western energy grid, and the United States, including, but not limited to, grid stability, reliability, and resiliency.
D. Methods of overcoming technical and economic challenges currently limiting lithium extraction, processing, and production from geothermal brines.
E. Safe environmental methods and standards for lithium extraction from geothermal brines and how this compares to other methods for deriving lithium.
F. Potential economic and environmental impacts to the state resulting from extraction, processing, and production of lithium and lithium-dependent products from geothermal brines.
G. The importance of, and opportunities for, the application of local, state, and federal incentives and investments to facilitate lithium extraction from geothermal brines, including, but not limited to, the following:
    a. Use of enhanced infrastructure financing districts, as defined in Section 53398.51 of the Government Code, or community revitalization investment authorities, as defined in Section 62001 of the Government Code.
    b. New employment tax credits in former enterprise zones.
    c. Income or franchise tax credits under agreements approved by the California Competes Tax Credit Committee.
    d. Sales tax exemptions for new manufacturing equipment.
    e. Leveraging tax incentives in federally recognized opportunity zones.
H. Recommendations for legislative or regulatory changes that may be needed to encourage lithium extraction from geothermal brines, including whether the

development of a centralized tracking system for lithium project permitting by state and local regulatory agencies would assist with developing the lithium industry.

The issues discussed by the Commission were often interrelated and applicable to several of the distinct statutory topics.

A. Actions that Will Support the Further Development of Geothermal Power that have the Potential to Provide the Cobenefit of Lithium Recovery from Existing and New Geothermal Facilities

Development of the Salton Sea geothermal resource has been particularly difficult and costly, even when compared to other geothermal fields in California, due to the high salinity and mineral content of the brines, which can damage and corrode equipment and create more solids to be managed during power generation. This problem, which has now become an opportunity, requires chemical engineering and advanced facility designs at the existing power plants.[142] The addition of other mineral recovery will add another source of revenue for the facilities. But representatives from CTR, EnergySource Minerals, and BHE Renewables have stated on numerous occasions that the two components of the facilities must stand on their own — in other words, both the lithium component must be independently viable, and the geothermal component must be independently viable to proceed with additional development.

Beyond costs, other considerations that will affect the ability to expand geothermal development in Imperial Valley are based on infrastructure limitations, primarily due to availability of transmission and water.

More than 900 MW of new geothermal power plants within Imperial Valley have been proposed to the IID interconnection queue. IID is studying the amount of new geothermal energy that can be added to the existing transmission system and additional transmission infrastructure needs to send the energy to other parts of California and the western United States.[143]

Among the mechanisms that support geothermal development are state mandates for overall renewable energy procurement, as well as mandates specific to procurement of baseload renewable resources and assuring broader systemwide reliability. In June 2021, the CPUC ordered the load-serving entities they regulate to procure 11.5 gigawatts (GW) of new electricity resources to come on-line between 2023 and 2026, with at least 1,000 MW coming from clean, firm resources, such as geothermal. The due date can be extended to June 1, 2028, if load-serving entities (regulated by the CPUC) demonstrate a good faith effort, such as an executed contract. Planning for and developing new transmission are needed to enable this growth.[144] The need for transmission infrastructure is further explored in the report below. In

142 Blue Ribbon Commission. 2022. "Transcript of the June 16, 2022, Blue Ribbon Commission Meeting." Pages 95–96. https://efiling.energy.ca.gov/GetDocument.aspx?tn=243846&DocumentContentId=77784.

143 Blue Ribbon Commission. 2022. "Transcript of the June 16, 2022, Blue Ribbon Commission Meeting." Pages 27–32. https://efiling.energy.ca.gov/GetDocument.aspx?tn=243846&DocumentContentId=77784.

144 Blue Ribbon Commission. 2022. "Transcript of the June 16, 2022, Blue Ribbon Commission Meeting." Pages 27–32. https://efiling.energy.ca.gov/GetDocument.aspx?tn=243846&DocumentContentId=77784.

addition, the recent state budget included authority for the IBank to finance clean energy transmission infrastructure investments.[145]

Identification of available water resources for industrial use will support the further development of existing and new geothermal power plants that could provide the cobenefit of lithium recovery. IID has about 20,400 AFY of water available for contracting to new nonagricultural development, including industrial use. [146] This water comes from IID's interim water supply policy. IID is looking at ways to conserve additional water for industrial use, as further described below.

In addition to planning for new transmission, and identifying additional water resources available for industrial use, streamlining processes for project permits, while continuing to provide environmental, public health, and community benefits, can help further goals to begin bringing new geothermal power plants online with the cobenefit of lithium recovery by 2024 — and additional projects beyond 2045 — with environmental monitoring and reporting continuing throughout the life of a project.

B. Market Opportunities for Lithium

As previously noted, lithium is a core component of the batteries and storage systems critical for decarbonizing the electricity and transportation sectors, as well as other uses, including batteries and other consumer products, including electronics, ceramics, glass products, and pharmaceuticals. Furthermore, the demand for lithium is increasing across the globe. Many experts provided information to the Blue Ribbon Commission regarding projections for global lithium demand, as well as national needs and the many benefits to developing a domestic source to serve this demand. During several workshops, the Commission received information from financial market experts, researchers, and project developers about the growth in the demand for lithium, impacts on prices, and ways that current and planned sources of lithium are expected to respond to increasing demand. The Commission also heard from battery manufacturers and EV industry representatives about how they source lithium and enter into agreements for this critical component of their products.

Global EV sales totaled 6.6 million vehicles in 2021, double the amount in 2020, and 2 million were sold in the first quarter of 2022.[147] Projections for overall lithium-ion battery demand, including commercial and passenger EVs, buses, and other e-vehicles; stationary storage, and consumer electronics, estimate a tenfold increase in demand between 2020 and 2030, with passenger EVs expected to be the largest source of lithium-ion battery demand.[148] Market

145 Assembly Bill 209. https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220AB209.

146 Blue Ribbon Commission. 2022. "Transcript of June 16, 2022, Blue Ribbon Commission Meeting." Pages 143-144. https://efiling.energy.ca.gov/GetDocument.aspx?tn=243846&DocumentContentId=77784.

147 International Energy Agency (IEA). May 23, 2022. "Global electric car sales have continued their strong growth in 2022 after breaking records last year." Press Release for *Global Electric Vehicle Outlook 2022*. https://www.iea.org/news/global-electric-car-sales-have-continued-their-strong-growth-in-2022-after-breaking-records-last-year.

148 Logan Goldie-Scot (BloombergNEF), Global Lithium Update. 2021. "Presentation for the March 25, 2021, Blue Ribbon Commission Meeting."
https://efiling.energy.ca.gov/GetDocument.aspx?tn=237359&DocumentContentId=70545.

information through September 2021 indicates around 240 battery "mega factories"[149] are in the pipeline worldwide, which is up from 10 mega factories in recent years.[150]

To keep pace with skyrocketing growth in EV production and sales, market analysts anticipate that lithium demand will increase from 2020 levels of less than 500,000 metric tons LCE per year to an estimate of 2.4 million tons per year in 2030. Actual forecasts vary among analysts and have adjusted over time however all forecasts indicate substantial growth in demand during this period, primarily due to the increase in EV manufacturing. Growth in demand for lithium is outpacing growth in supply.[151] Market analysts further anticipate there will be a lithium deficit from 2022 onwards if more lithium production does not come on-line.[152] Until recently, prices for lithium have been relatively low. Based on graphs available on the Benchmark Minerals Intelligence webpages, Lithium prices began to increase slowly in early 2021, significantly in late 2021, and have shown nearly 350% increase over the last year.[153] Until the recent increase in prices, there was not much investment in developing new sources.[154]

Lithium prices are seeing the impact of market projections for increases in demand. When information was provided to the Commission in September 2021, lithium had seen a 100 percent year-to-date increase in prices,[155] and at the time of this report, the year-over-year change in prices showed more than 350 percent increase in price.[156] With prices rising quickly and growing confidence in the projections for increased demand, there is now a great deal of investment in developing additional supplies, but this will take time to develop.[157] Experts noted that it is not just the quantity of lithium that matters, but also the quality, with any new sources needing to prove that they can develop a product of the necessary quality required by product manufacturers.[158]

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149 A mega factory is a large-scale manufacturing facility, such as a large lithium-ion battery manufacturing facility.

150 Blue Ribbon Commission. 2021. "Transcript for the September 30, 2021, Blue Ribbon Commission Meeting." Page 63. https://efiling.energy.ca.gov/GetDocument.aspx?tn=240135&DocumentContentId=73590.

151 Blue Ribbon Commission. 2021. "Transcript for the September 30, 2021, Blue Ribbon Commission Meeting." Page 64. https://efiling.energy.ca.gov/GetDocument.aspx?tn=240135&DocumentContentId=73590.

152 EV Reporter. 2021. "Lithium market might go into deficit from 2022, says Benchmark Mineral Intelligence." Accessed on September 1, 2022. https://evreporter.com/lithium-market-might-go-into-deficit-from-2022/.

153 "Lithium Price Assessments". Benchmark Mineral Intelligence. Accessed on August 31, 2022. https://www.benchmarkminerals.com/lithium-prices/.

154 Blue Ribbon Commission. 2021. "Transcript for the September 30, 2021, Blue Ribbon Commission Meeting." Page 65. https://efiling.energy.ca.gov/GetDocument.aspx?tn=240135&DocumentContentId=73590.

155 Blue Ribbon Commission. 2021. "Presentation for the September 30, 2021, Blue Ribbon Commission Meeting." Slide 49. https://efiling.energy.ca.gov/GetDocument.aspx?tn=239862&DocumentContentId=73302.

156 Benchmark Mineral Intelligence. 2022. "Lithium Price Trends." Accessed August 4, 2022. https://www.benchmarkminerals.com/lithium-prices/.

157 Blue Ribbon Commission. 2021. 2021. "Presentation for the September 30, 2021, Blue Ribbon Commission Meeting." Pages 65–68. https://efiling.energy.ca.gov/getdocument.aspx?tn=239862.

158 Blue Ribbon Commission. 2021. "Presentation for the September 30, 2021, Blue Ribbon Commission Meeting." Page 66. https://efiling.energy.ca.gov/getdocument.aspx?tn=239862.

Additional considerations when evaluating the markets for lithium are the technical specification requirements for lithium products that are set by end users, such as battery component and battery manufacturers. As noted in Chapter 2, lithium is typically produced for battery manufacturing, as lithium carbonate or lithium hydroxide monohydrate. Since the battery and battery component manufacturers set the final specifications specific to their products and require commitments well in advance of production to ensure their product will not be disrupted, lithium producers must enter into agreements before actually recovering and producing lithium. With lithium recovery from geothermal brines in Imperial Valley still in early stages, there is greater uncertainty, which can make establishing the necessary agreements more difficult. However, at the time of this report, CTR and EnergySource Minerals have both entered into agreements for the sale of lithium from their proposed DLE facilities.

The location of lithium end users, procurement policies that favor the most environmentally responsible production methods, and competition from other sources of lithium are other factors the Blue Ribbon Commission considered in exploring market opportunities. During public meetings, numerous speakers recognized that there is opportunity for developing Lithium Valley in the Salton Sea region instead of sending the battery feedstock overseas for further processing or manufacturing of battery and battery components. Development of component and product manufacturing in the same region of the lithium supply would also support domestic supply and minimize the environmental impacts of lithium-dependent products on a life-cycle basis. Minimizing environmental impact or conversely optimizing for environmental benefit is a growing priority for procurement policies in many organizations, including those that procure EVs and energy storage. Modern companies and agencies evaluate performance across sustainability initiatives, including the impacts of procurement that can definitely position lithium produced from geothermal brines at an advantage over lithium produced through methods with significant environmental impact and its proximity to the California and national market.

Experts also provided information about the competition that is developing from other sources, often at a cheaper price and with lower labor and environmental standards, and recognize the opportunity in current markets for lithium, driven by increasing demand and the anticipated shortfall in supply. At the June 2022 public meeting, project developers discussed competition coming from other potential lithium sources, including mining activities in other states (such as Nevada), that could have an advantage to developing lithium due to having an experienced mining workforce and a history with minerals mining.[159] Suppliers coming into the marketplace quickly and with the lowest costs of production have a competitive advantage.

The Blue Ribbon Commission finds that there are tremendous market opportunities for lithium that can be produced competitively and through an environmentally favorable method such as the proposed recovery of lithium from geothermal brines using DLE technologies. The Commission further finds that developing a domestic source for lithium will support state and national priorities, and that locating the processing and manufacturing of products near the source of lithium would be meaningful in realizing the full value and potential environmental benefit of this resource. Timing is critical, and the early commitments for the purchase of

159 Blue Ribbon Commission. 2022. "Transcript of the June 30, 2022, Blue Ribbon Commission Meeting." https://efiling.energy.ca.gov/GetDocument.aspx?tn=244229&DocumentContentId=78154.

lithium from planned facilities are important milestones in supporting the development of the facilities. While lithium recovery and production enterprises must compete within a global market, the state should continue to support the success of environmentally preferable, California-based lithium recovery facilities.[160]

We recognize the industry perspective that urgent action is needed to meet state and national emission free mandates to avoid missing this unique opportunity presented by lithium recovery at the Salton Sea KGRA. The year 2024 has been identified by the auto industry as a critical deadline for Lithium Valley DLE facilities to be operational.

We also understand that due to the complexity of the lithium production supply and production chain, the need for considerable coordination between state, local and federal agencies cannot be underestimated.

C. The Potential Benefits of, and Added Value to, Existing and New Geothermal Facilities in Areas that Contain Mineral-Rich Brines for the State, the Western Energy Grid, and the United States, Including, but not Limited to, Grid Stability, Reliability, and Resiliency

Geothermal energy is a clean, firm, renewable resource. Electricity system benefits of geothermal power plants include:[161]

- Grid stability. The rotating mass of steam-powered electricity generators in geothermal power plants helps the local electricity system absorb short-term fluctuations, such as sudden stops and starts of intermittent electricity resources.
- Grid reliability. Geothermal power plants provide a sustainable and stable source of electricity and are characterized as a baseload renewable resource. Salton Sea KGRA geothermal power plants are designed to operate best at a constant level rather than ramping up and down to follow load.
- Grid resiliency. If the electricity grid goes down, geothermal power plants in Imperial Valley are designed so that they do not turn off completely. The geothermal heat is still there and can keep generating electricity, even if the grid goes down, which enables geothermal power plants to help restart the grid.

The Salton Sea KGRA is in the IID balancing authority area, but much of the electricity generated from new geothermal power plants is expected to be exported outside IID to the California Independent System Operator (California ISO or ISO) balancing authority area and

160 The Blue Ribbon Commission also learned that product manufacturers are implementing sustainability initiatives that further support demand for lithium that was produced in a manner with the lowest possible environmental footprint. For instance, Ford joined a number of other vehicle manufacturers as members of the Initiative for Responsible Mining Assurance (IRMA) to ensure materials in the supply chain for their products meet high quality standards for environmental and social responsibility.

161 Blue Ribbon Commission. 2022. "Transcript of the June 16, 2022, Blue Ribbon Commission Meeting." Pages 32–33, 41, 53–55. https://efiling.energy.ca.gov/GetDocument.aspx?tn=243846&DocumentContentId=77784.

the western electricity grid.[162] Resource and transmission planning processes at the California Air Resources Board (CARB), CEC, California Public Utilities Commission (CPUC), and ISO, as well as IID are taking the potential for new geothermal power plants in Imperial Valley into consideration.

The CPUC conducts integrated resource planning (IRP) for load-serving entities that serve about 75 percent of California's electricity load. The remaining load is served by publicly owned electric utilities, such as IID. The latest IRP cycle was guided by the state's SB 32 goal of reducing GHG emissions 40 percent by 2030 and achieving the deep decarbonization goals of SB 100. The IRP process relies on key policy guidance from the CARB scoping plan for California's greenhouse gas emission reductions, joint agency analysis for SB 100, and load assumptions taken from the CEC demand forecast. The IRP process identifies a preferred system plan. The preferred system plan is used by the ISO in its transmission planning process.[163]

Based on information from the CPUC's most recent IRP preferred system plan, the ISO will study transmission for 1,100 MW of new geothermal capacity by 2032 in its transmission planning process for 2022–23. This includes 600 MW of new geothermal capacity from the Imperial Valley.[164]

In addition, the CEC, CPUC, and California ISO coordinate analysis to inform long-term planning. To inform the ISO's 20-year transmission outlook, the CEC, CPUC, and ISO published a document in 2021 called the 2040 Starting Point Scenario.[165] The 2040 Starting Point Scenario is designed to provide information for a wide range of potential transmission needs driven by a diverse combination of potential renewable and zero-carbon resource opportunities. This scenario includes more than 2,300 MW of new geothermal in California and is being used to study transmission requirements for integrating the portfolio of resources assumed in 2040 in the starting point scenario, including transmission that would integrate possible future geothermal power plants in Imperial County.[166]

The Imperial Valley needs robust transmission capability to move electricity from new geothermal power plants to areas with energy demand. Existing transmission paths from the Imperial Valley to other parts of the state and western grid do not have the capability to deliver significant new geothermal energy.[167]

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162 Blue Ribbon Commission. 2022. "Transcript of the June 16, 2022, Blue Ribbon Commission Meeting." Pages 30–32. https://efiling.energy.ca.gov/GetDocument.aspx?tn=243846&DocumentContentId=77784.

163 Blue Ribbon Commission. 2022. "Transcript of the June 16, 2022, Blue Ribbon Commission Meeting." Pages 22–25. https://efiling.energy.ca.gov/GetDocument.aspx?tn=243846&DocumentContentId=77784.

164 Blue Ribbon Commission. 2022. "Presentation — Convening of the Blue Ribbon Commission." Slide 25. https://efiling.energy.ca.gov/GetDocument.aspx?tn=243673&DocumentContentId=77497.

165 Blue Ribbon Commission. 2022. "Transcript of the June 16, 2022, Blue Ribbon Commission Meeting." Page 61. https://efiling.energy.ca.gov/GetDocument.aspx?tn=243846&DocumentContentId=77784.

166 California Energy Commission. 2021. "SB 100 Starting Point for the CAISO 20-Year Transmission Outlook" CEC Docket 21-SIT-01, TN#: 239685. https://efiling.energy.ca.gov/GetDocument.aspx?tn=239685&DocumentContentId=73101.

167 Blue Ribbon Commission. 2022. "Transcript of the June 16, 2022, Blue Ribbon Commission Meeting." Page 42. https://efiling.energy.ca.gov/GetDocument.aspx?tn=243846&DocumentContentId=77784.

Imperial Valley is rural, so it cannot use all the power locally due to the lack of local demand. Not only does IID provide electricity to about 158,000 retail customers – in Imperial County, and in portions of Riverside and San Diego Counties-- it is also its own balancing authority. The highest hourly demand for electricity IID experiences, IID's "peak load," is 1,185 MW.[168] The IID system is ready to export 750 MW and has the ability to double exports. IID has proposed new transmission lines for new installed capacity, including an interim solution (up to 1,750 MW of export) and a long-term solution (up to 3,000 MW) to support export of geothermal energy from the IID electricity system.[169]

The 2022-23 budget package specifically authorizes the IBank to finance clean energy transmission projects under its Climate Catalyst Revolving Loan Fund, which can support development of transmission for the region.[170]

D. Methods of Overcoming Technical and Economic Challenges Limiting Lithium Extraction, Processing, and Production from Geothermal Brines

DLE is not a new technology. Rather, it has been studied for decades and is used now in certain applications that recover minerals. DLE is being considered more broadly due in large part to the associated environmental benefits compared to other lithium extraction methods. The Blue Ribbon Commission heard from current project developers and experts that there is confidence that the technologies planned and in development have a high likelihood of success. But supply chain issues and the impact of inflation on cost of equipment, metals, and materials pose the greatest risk.[171] Technological challenges working with the brines, due to the composition and conditions, were identified as areas to look for innovation in the future.[172]

Representatives from EnergySource Minerals, BHE Renewables, and CTR, as well as other experts, conveyed that while the DLE technologies being developed are similar, each project is unique in terms of engineering, process, and the specific technology, which are each proprietary designs. An independent industry researcher described the technologies as the selective removal of lithium using engineered materials such as fabricated micro- or nanomaterials.[173] So, any technological challenge is not necessarily with the lithium chloride recovery step, but there can be technological challenges in applying these technologies to the Salton Sea geothermal brines and the steps that precede the actual lithium chloride recovery.

168 Blue Ribbon Commission. 2022. "Transcript of the June 16, 2022, Blue Ribbon Commission Meeting." Page 28. https://efiling.energy.ca.gov/GetDocument.aspx?tn=243846&DocumentContentId=77784.

169 Blue Ribbon Commission. 2022. "Transcript of the June 16, 2022, Blue Ribbon Commission Meeting." Pages 28–32. https://efiling.energy.ca.gov/GetDocument.aspx?tn=243846&DocumentContentId=77784.

170 Assembly Bill 209 (2022), https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220AB209.

171 Blue Ribbon Commission. 2022. "Transcript of the June 16, 2022, Blue Ribbon Commission Meeting." Page 85, 92-93. https://efiling.energy.ca.gov/GetDocument.aspx?tn=243846&DocumentContentId=77784.

172 Blue Ribbon Commission. 2022. "Transcript of the June 16, 2022, Blue Ribbon Commission Meeting." Page 98. https://efiling.energy.ca.gov/GetDocument.aspx?tn=243846&DocumentContentId=77784.

173 Blue Ribbon Commission. 2022. "Transcript of the June 16, 2022, Blue Ribbon Commission Meeting." Page 95. https://efiling.energy.ca.gov/GetDocument.aspx?tn=243846&DocumentContentId=77784.

These challenges have to do with pretreating the brines, removing components that interfere with the process, keeping solutions in the proper form throughout the process, ensuring that only the targeted components are removed and that the other components of the brines do not damage equipment. For instance, some speakers noted that there are questions about how stable the adsorbents are at high temperature and the pH values of these brines and questioned how many cycles an adsorbent can be used before it must be replaced.[174] While there do not appear to be technology challenges limiting development at this time, this is a new enterprise that will require adjustment as facilities reach for commercial scale and present opportunities for innovation and improvement over time.[175]

When exploring the economic factors that could limit lithium recovery and production from geothermal brines, the Blue Ribbon Commission notes that this topic was covered in prior sections of this report titled "Market Opportunities for Lithium" and "Potential Economic and Environmental Impacts to the State Resulting from Extraction, Processing, and Production of Lithium and Lithium-Dependent Products From Geothermal Brines." The facilities are being developed at a dynamic time in the market. Early commitments for purchase of lithium from these facilities are essential to development, and the economics factored into those decisions are sensitive to change. The state can take certain action to lower risk and improve the market conditions for domestic lithium produced in an environmentally preferrable method.

The Blue Ribbon Commission finds that technological issues can be addressed to enable the recovery of lithium from geothermal brines, but also notes that there are no commercial-scale facilities operating to contribute to this evaluation. As demonstration, pilot, and commercial-scale projects reach operations, the developers will continue to learn and adjust to optimize facilities. Furthermore, research and development continue in the area of minerals recovery technologies, and the efforts of state and national agencies to support these efforts financially – both directly and by facilitating private capital investments – will contribute to the long-term success of the industry and related product manufacturing efforts. The Commission also notes that clean energy technologies are an area of constant innovation and that the end users of lithium dictate the products and product specifications needed for their technologies. As end uses advance and change over time, additional technological improvements may be needed to meet evolving needs.

An area the Commission explored that indirectly presents barriers to lithium development and the ability to attract additional economic activity is infrastructure investment and improvement needed throughout the region. Many speakers and comments noted the need for road and bridge improvements limited transportation options in some locations and updates needed to water systems. Moreover, the Blue Ribbon Commission experienced firsthand while conducting meetings in communities around the region the challenges of inconsistent internet access, which is critical to modern business development. The Commission recognizes the challenge developers and local governments face when making significant investments in infrastructure to support uncertain future activity without confidence that future revenue can repay the investment. In cases where it is necessary to recoup the costs of infrastructure development,

174 An *adsorbent* attracts molecules to its surface.

175 Blue Ribbon Commission. 2022. "Transcript of the June 16, 2022, Blue Ribbon Commission Meeting." Pages 79-85. https://efiling.energy.ca.gov/GetDocument.aspx?tn=243846&DocumentContentId=77784.

the Commission encourages developers and local agencies to seek state and federal funding and consider creative solutions that draw on other successful projects and financing structures that can support these critically necessary improvements.

The 2022-23 state budget established the lithium excise tax and requires a study to evaluate whether to use a different structure for the tax. The study is due by the end of 2023. As part of this study, one option to consider is indexing the volume-based tax and tracking with the market price.

E. Safe Environmental Methods and Standards for Lithium Extraction from Geothermal Brines and How This Compares to Other Methods for Deriving Lithium

Chapter 2 described the two prevalent commercial methods for recovering lithium: hard rock mining and evaporation ponds. Mining is environmentally harmful. It scars landscapes, adversely affects ecosystems and habitat, is water- and energy-intensive, and can pollute air and water resources. Evaporation ponds are water-intensive, can require thousands of square miles of land, and is environmentally destructive. In contrast, the environmental impacts of the DLE technologies proposed for use in the Imperial Valley are designed to allow a lower-impact and more sustainable and environmentally beneficial approach to lithium recovery in terms of factors such as land use, water use, time to market, and carbon intensity.

The Blue Ribbon Commission recognizes that the DLE technologies would be deployed for specific projects and that the projects will likely be colocated with existing or new geothermal power plants. This section discusses the existing standards that would apply to these projects, recognizing that Imperial County would have primary permitting jurisdiction for DLE projects in Imperial County, as well as primary permitting jurisdiction for a geothermal power plant with a generating capacity less than 50 MW. Geothermal power plants with a generating capacity of 50 MW or more are within the exclusive permitting jurisdiction of the CEC.[176] The permitting agencies are also typically CEQA lead agencies principally responsible for determining if CEQA applies to a project and, if so, whether an EIR, mitigated negative declaration, or negative declaration will be required.

Approvals are also required from the local air and water quality control districts.[177] Also, approval may be required from the CDFW, which is concerned with how a project will impact species and habitat, and other state and local agencies. If wells will be drilled, approval is required from the California Department of Conservation's Geologic Energy Management Division. Furthermore, if projects are on federal land, federal agency approvals are required, as well as compliance with the National Environmental Policy Act. For instance, if a project impacts exposed lakebed of the Salton Sea, it will also require a permit from the U.S. Army

176 The Blue Ribbon Commission is aware that the law allows the CEC to delegate its permitting authority to counties for geothermal power plants with a generating capacity of 50 MW or more. (Public Resources Code, § 25540.5.) To date, this authority has not been so delegated. But on July 13, 2022, amendments to the CEC's regulations relating to delegation took effect. The amendments streamline the process for the CEC to make this delegate full authority for the certification of geothermal power plants.

177 Imperial County Air Pollution Control District. 2020. "Rule 201. Permits Required." https://apcd.imperialcounty.org/wp-content/uploads/2020/01/1RULE201.pdf.

Corps of Engineers. For complex projects with more than minimal impacts to water resources, the U.S. Army Corps of Engineers conducts a project-specific environmental justice evaluation.[178] Other potential federal lead or cooperating agencies include Department of Energy, Bureau of Land Management, U.S Fish and Wildlife Service.

The California Environmental Quality Act

CEQA and its implementing CEQA Guidelines require lead agencies to review the environmental impacts of proposed projects and, if those impacts may be significant, consider feasible alternatives or mitigation measures that would substantially reduce the effect to less than significant, if possible.[179, 180, 181] Among other things, the CEQA Guidelines explain how to determine whether an activity is subject to environmental review, what steps are involved in the environmental review process, and what are the required content of environmental documents. The CEQA Guidelines apply to public agencies throughout the state, including local governments, special districts, and state agencies.

The review of projects under CEQA requires an evaluation of topics, as identified, and further described in the CEQA Guidelines.[182] The topics required to be considered are:

- Aesthetics
- Biological Resources
- Geology/Soils
- Hydrology/Water Quality
- Noise
- Recreation
- Utilities/Service Systems
- Agriculture and Forestry Resources
- Cultural Resources
- Greenhouse Gas Emissions
- Land Use/Planning
- Population/Housing
- Transportation/Traffic
- Wildfire
- Air Quality
- Energy
- Hazards and Hazardous Materials
- Mineral Resources
- Public Services
- Mandatory Findings of Significance
- Tribal Cultural Resources

178 Blue Ribbon Commission. 2021. "Transcript of the October 28, 2021, Blue Ribbon Commission Meeting." Pages 110-113 and 119. https://efiling.energy.ca.gov/GetDocument.aspx?tn=240735&DocumentContentId=74139.

179 California Public Resources Code, beginning with Section 21000.

180 California Code of Regulations, Title 14, Division 6, Chapter 3.

181 The term "project" under CEQA means an activity which may cause either a direct physical change in the environment, or a reasonably foreseeable indirect physical change in the environment, and which is any of the following: (a) an activity directly undertaken by any public agency, (b) an activity undertaken by a person which is supported, in whole or in part, through contracts, grants, subsidies, loans, or other forms of assistance from one or more public agencies, and (c) an activity that involves the issuance to a person of a lease, permit, license, certificate, or other entitlement for use by one or more public agencies (California Public Resources Code Section 21065).

182 The growth-inducing impact of the proposed project is included as part of the consideration and discussion of significant environmental impacts. As stated in the Guidelines, this means: "Discuss the ways in which the proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment." Association of Environmental Professionals. 2022. CEQA Guidelines. p. 219, https://www.califaep.org/docs/2022_CEQA_Statue_and_Guidelines.pdf.

CEQA requires project monitoring and reporting requirements throughout the life cycle of a project. Standards are in place to assess cumulative impacts as well. In addition, CEQA specifies requirements for lead agency consultation with Tribes as part of the project permitting process. CEQA also includes requirements that the public must have opportunities to review and comment on environmental documents and decision making.

Throughout this work, the Blue Ribbon Commission consistently heard concerns and fears from local residents and representatives of community organizations about potential negative impacts on public health in this region, which already experiences a high level of pollution and associated negative health outcomes. During the March 24, 2022, meeting, the Commission learned that health impact assessments[183] would provide additional information on potential distributional impacts of a proposed project.

The CEC's Exclusive Permitting Jurisdiction

As mentioned above, power plants with a generating capacity of 50 MW or greater are under the exclusive permitting jurisdiction of the CEC. For these projects which can include geothermal power plants, the Application for Certification (AFC) is the standard licensing process. The CEC's power plant site certification program is a certified regulatory program under CEQA and analyzes whether the power plant will have significant environmental impacts. In addition, the CEC analyzes the public health and safety, engineering, reliability, and sustainability of the project. As a one-stop shop, the CEC's process incorporates all state, local, and regional agencies' requirements necessary for a plant to be constructed and operated, including the requirements for the state and local additional permits described above, unless the CEC adopts overriding findings that the facility is required for public convenience and necessity and there are no more prudent or feasible means of achieving public convenience and necessity. The CEC also coordinates its review with federal agencies that will be issuing permits.

The Blue Ribbon Commission is aware that the law allows the CEC to delegate its exclusive permitting authority to counties for geothermal power plants with a generating capacity of 50 MW or more. (Public Resources Code, § 25540.5.) For counties to qualify, the county must have a geothermal element in its general plan. The county must then petition the CEC and demonstrate that the county can implement an equivalent certification program. To date, this authority has not been delegated. On July 13, 2022, amendments to the CEC's regulations relating to delegation took effect. The amendments streamline the process for the CEC to approve this delegation of authority for the certification of geothermal power plants, while maintaining the requirement that qualifying counties implement robust environmental review and public participation while considering applications for new geothermal power plants.

The Three Projects in Development in Imperial County

As discussed above, each of the planned DLE projects in Imperial County will use specific, proprietary technologies, but there are common features to this type of mineral recovery. Considering only the lithium recovery component and not the geothermal power plant, the amount of land needed is small when compared to large mining areas and evaporation ponds.

183 U.S. Environmental Protection Agency. 2022. "Health Impact Assessments." Last modified August 30, 2022. https://www.epa.gov/healthresearch/health-impact-assessments.

The EnergySource Minerals Project ATLiS is described as covering less than 100 acres. For comparison, 100 acres is about 80 American football fields.

Water will be needed for DLE facilities, but far less than the amount needed for mining or evaporation ponds. For example, BHE Renewables plans to limit freshwater usage to 50,000 gallons per metric ton of lithium carbonate, which is 90 percent less than the amount used in lithium evaporation ponds in South America.[184] There will be GHG emissions associated primarily with the energy demands for the facility and energy needed to pump water used at the facility. Due to the state's Renewables Portfolio Standard requirements, however, the utility will reduce GHGs through the adoption of increasing amounts of renewable resources, and geothermal is a renewable low-carbon resource.

IID is a local utility that provides public power to most of Imperial County and sections of Riverside County and San Diego County. The utility it is also a major supplier of water to the region, providing Colorado River water to farmland and nine communities in Imperial County.

The permitting and CEQA review statuses of projects planned by EnergySource Minerals, CTR, and BHE Renewables are summarized below.

EnergySource Minerals: Project ATLiS

The EnergySource Minerals Project ATLiS received a conditional use permit from Imperial County in 2021.[185] The project activities evaluated in an EIR for the project included:

- Construction and operation of brine supply and return pipelines and other associated interconnection facilities with the Hudson Ranch 1 power plant.
- Construction of a primary access road from McDonald Road (about 500 feet west of the HR 1 entrance), a second primary access about 800 feet west, and an emergency access entrance only from Davis Road.
- Paving of McDonald Road from State Route 111 (Highway 111) to English Road (about 2 miles).
- Construction of a power interconnection line from the IID and Hudson Ranch 1 switchyard located at the northeast corner of the Hudson Ranch 1 site.
- Construction of associated facilities between Hudson Ranch 1 and the project site to facilitate the movement of brine and other services.
- Construction of a yard for storing materials and equipment (laydown yard) that will also support temporary offices during construction as well as serve as a truck management yard during operations.
- Construction of offices, repair facilities, shipping and receiving facilities, and other infrastructure, including the relocation of the IID structures and road improvements at Highway 111.

184 Blue Ribbon Commission. July 29, 2021. "Transcript of the July 29, 2021, Blue Ribbon Commission Meeting." Page 97. https://efiling.energy.ca.gov/GetDocument.aspx?tn=239800&DocumentContentId=73245.

185 Imperial County, Planning and Development Services Department. 2021. "Project Report." https://www.icpds.com/assets/hearings/02.-WSA,FIER,-MMRP,-CUP20-0008,-PM02485-Energy-Source-Mineral-ATLiS-PC-Pkg.pdf.

- Aesthetic considerations were limited to the temporary construction period and were determined not to substantially degrade the existing visual character or public views of the site or surroundings.[186]

Based on comments received in response to the initial study, the notice of preparation of an EIR, and public meetings, the county determined that the draft EIR would analyze project-related impacts relative to 14 substantive potential impact areas: air quality, biological resources, cultural resources, energy, geology and soils, greenhouse gas emissions, hazards and hazardous materials, hydrology and water quality, noise, transportation, and utilities and service systems.[187] The EIR for this project determined that the project would result in less than significant impacts with incorporation of mitigation requirements for the following identified potentially significant impacts:[188]

- Biological resources (potential impact to species)
- Geology and soils (potential impacts resulting from seismic ground shaking, potential impacts to paleontological resources)
- Transportation (vehicle miles traveled, road intersection improvement)
- Water supply

Regarding water supply, the EIR stated in pertinent part:[189]

> The Project represents 14 percent of the unallocated supply set aside in the [Interim Water Supply Policy] IWSP for nonagricultural projects and approximately 14 percent of forecasted future nonagricultural water demands planned in the Imperial [Integrated Regional Water Management Plan] IRWMP through 2055.The amount of water available and the stability of the [Imperial Irrigation District] IID water supply along with on-farm and system efficiency conservation and other measures being undertaken by IID and its customers ensure that the Project's water needs will be met for the next 30 years. When drought conditions exist within the IID water service area, as has been the case for the past decade or so, the water supply available to meet agricultural and nonagricultural water demands remains the same as normal year water supply because IID continues to rely on its entitlement for Colorado River water. Due to the priority of their water rights and other agreements, drought affecting Colorado River water supplies causes shortages for Arizona, Nevada, and Mexico,

186 Imperial County, Planning and Development Services Department. 2021. "Project Report." https://www.icpds.com/assets/hearings/02.-WSA,FIER,-MMRP,-CUP20-0008,-PM02485-Energy-Source-Mineral-ATLiS-PC-Pkg.pdf.

187 CEQA Findings for the EnergySource Mineral ATLiS Project, page 4. In Imperial County, Planning & Development Services Department. 2021. "Project Report." https://www.icpds.com/assets/hearings/02.-WSA,FIER,-MMRP,-CUP20-0008,-PM02485-Energy-Source-Mineral-ATLiS-PC-Pkg.pdf.

188 Final Environmental Impact Report for the EnergySource Mineral ATLiS Project. In Imperial County, Planning & Development Services Department. 2021. "Project Report." https://www.icpds.com/assets/hearings/02.-WSA,FIER,-MMRP,-CUP20-0008,-PM02485-Energy-Source-Mineral-ATLiS-PC-Pkg.pdf.

189 Final Environmental Impact Report for the EnergySource Mineral ATLiS Project, page 21. In Imperial County, Planning and Development Services Department. 2021. "Project Report." https://www.icpds.com/assets/hearings/02.-WSA,FIER,-MMRP,-CUP20-0008,-PM02485-Energy-Source-Mineral-ATLiS-PC-Pkg.pdf.

not California or IID. Therefore, the likelihood that IID will not receive its annual 3.1 million AF apportionment under the Quantification Settlement Agreement obligations of Colorado River water is low due to the high priority of the IID entitlement relative to other Colorado River contractors (see Appendix I for further details on the IID's water rights). If such reductions were to come into effect within the life of the 30-year Project, a significant impact would occur. If such reductions do occur, Mitigation Measure (MM) UTIL-1 would be implemented, requiring the Applicant to work with IID to ensure any reduction in water availability during the life of the Project can be managed. Therefore, with implementation of MM UTIL-1, impacts would remain less than significant.

Given the uncertainty of water supply to the region as a result of the current drought and impacts of global warming, the project developers will need to work with IID to address their plans for water use.

CTR**: Hell's Kitchen Project (Phase 1)**

In December 2021, subsidiaries of CTR[190] submitted conditional use permit applications to Imperial County for the Hell's Kitchen PowerCo 1 (geothermal power plant) and LithiumCo 1 (DLE facility) projects. Imperial County posted a notice of preparation and an initial study and environmental analysis in March 2022 for a single combined geothermal power plant and lithium recovery project, the Hell's Kitchen PowerCo1 and LithiumCo1 Project, and held a public EIR scoping meeting in April 2022. Imperial County received comments from the Native American Heritage Commission in April 2022 and CDFW in May 2022.[191]

The initial study and environmental analysis identified the following areas with potentially significant impacts that will be analyzed and discussed in the EIR: aesthetics, air quality, biological resources, cultural resources, energy, geology and soils, greenhouse gasses, hazards and hazardous materials, hydrology and water quality, noise, transportation, utilities and services systems, and wildfire.[192]

BHE Renewables: Demonstration Projects, Plans for Commercial DLE Facilities, and Plans for New Geothermal Power Plants

The first BHE Renewables DLE demonstration project to recover lithium from geothermal brine received a permit from Imperial County and was categorically exempt from CEQA.[193] The

190 As described in the cover letter to the Conditional Use Permit Applications, dated December 10, 2021, Hell's Kitchen Powerco 1, LLC and Hell's Kitchen LithiumCo 1 LLC are subsidiaries of Hell's Kitchen HoldingCo 1 LLC and Controlled Thermal Resources.

191 Imperial County. 2022. "Hell's Kitchen PowerCo1 and LithiumCo1 Project." In California Governor's Office of Planning and Research. California Environmental Quality Act CEQAnet Web Portal. https://ceqanet.opr.ca.gov/2022030704.

192 Imperial County. 2022. *Initial Study and Environmental Analysis for Hell's Kitchen PowerCo 1 and LithiumCo 1 Project*. https://files.ceqanet.opr.ca.gov/277330-1/attachment/umqX2ZYUYgPDPnQmJ1zkDyRyVLAng5T8MBZGSmrgzFDiB8GLtk0M8WcbNQvXIZ8U6A4g_EZEGzbWm6l_0.

193 CEQA allows for categorical exemptions of classes of projects that generally are considered not to have potential impacts on the environment. Categorical exemptions are defined in the CEQA Guidelines (14 CCR Section 15300-15331).

project uses brine from an existing geothermal power plant. BHE Renewables is also developing a second demonstration project at 1/10 of commercial scale to additionally demonstrate the processing of lithium chloride recovered from geothermal brine into battery grade compounds.[194] Depending on the results of its demonstration projects, BHE Renewables plans to build commercial-scale DLE facilities that use geothermal brine from its existing geothermal power plants and is considering expanding existing geothermal production and building new geothermal power plants with DLE facilities.[195] BHE Renewables representatives stated at the June 30, 2022 public meeting, they are looking at developing an additional 377 MW net in geothermal power capacity in the Imperial Valley.[196] Additional information on potential environmental impacts and mitigation associated with future facilities will be available as BHE Renewables projects apply to Imperial County for required permits.

F. Potential Economic and Environmental Impacts to the State Resulting from Extraction, Processing, and Production of Lithium from Geothermal Brines and Lithium-Dependent Products

This section is structured on three subtopics: environmental impacts, economic impacts, and workforce considerations.

Environmental Impacts and Public Health

Recovery of lithium from geothermal brines has the potential to help California reduce greenhouse gases and improve air quality by supplying battery-grade lithium compounds needed to produce batteries for clean energy and transportation products such as electric vehicles and trucks and battery storage systems. As a new industry potentially develops to recover and process lithium from geothermal brine, care is needed to identify, avoid, reduce, and mitigate potential negative impacts from these new activities.

The report previously discussed the permitting process and ways that CEQA applies to individual geothermal power plant and DLE facility projects. This report also describes the EIR that was certified by Imperial County for the EnergySource Minerals Project ATLiS, as well as Imperial County's environmental review for CTR's proposed geothermal power plant and DLE facility. The permitting documents for the EnergySource Minerals Project ATLiS are extensive, so this report provides a summary of topics that were elevated during public meeting to be of particular interest to the Blue Ribbon Commission and the community: traffic, air quality, chemical use, waste streams, water use and wastewater. While the Commission recognizes that each project that is considered by a state agency or county is subject to review on the merits and based on project design and location, the following information from the

194 Blue Ribbon Commission. 2022. "Transcript of the June 16, 2022, Blue Ribbon Commission Meeting." Page 100. https://efiling.energy.ca.gov/GetDocument.aspx?tn=243846&DocumentContentId=77784.

195 Blue Ribbon Commission. 2022. "Transcript of the March 24, 2022, Blue Ribbon Commission Meeting." Page 26. https://efiling.energy.ca.gov/GetDocument.aspx?tn=242568&DocumentContentId=76086.

196 Blue Ribbon Commission. 2021. "Transcript of the August 26, 2021, Blue Ribbon Commission Meeting." Page 78. https://efiling.energy.ca.gov/GetDocument.aspx?tn=240014&DocumentContentId=73462.

EnergySource Minerals Project ATLiS EIR provides a foundation for reasonable inferences about other potential projects.

Traffic

Traffic will increase during the construction and operations of each facility. Specific to the EnergySource Minerals Project ATLiS alone, once operational, the plant will run 24 hours per day, seven days a week, generating an estimated 24 trucks per day (in and out), transporting outgoing products, delivering chemicals and materials, and managing wastes. All transportation activities must comply with existing legal requirements for safety and addressing environmental impacts. The Imperial County Transportation Commission is preparing an update to the *Long Range Transportation Plan* that will provide a detailed roadmap of the regional transportation system of Imperial County for the next 30 years. The update, which is underway and anticipated to be complete by Summer of 2023,[197] will identify transportation priorities, funding, and policies necessary to move Imperial County forward, including those that would result from lithium recovery development.

Air Quality

Air quality is a key concern of residents around the Salton Sea, and the Blue Ribbon Commission carefully considered the descriptions of current conditions, information regarding potential air emissions from the anticipated new facilities, and residents' concerns regarding the current and future levels of dust and particulate matter from the nearby exposed playa and these facilities.

According to the EIR for the EnergySource Minerals Project ATLiS, the facility will be located within the central portion of Imperial County, which is part of the Salton Sea Air Basin. The Salton Sea Air Basin includes the central portion of Riverside County and all of Imperial County. Different agencies oversee air quality within this basin with the Riverside County portion regulated by the South Coast Air Quality Management District, and the Imperial County portion regulated by the Imperial County Air Pollution Control District (ICAPCD). Federal and State laws also regulate the air pollutants emitted by stationary and mobile sources.

The EnergySource Minerals project will be required to obtain air permits and to adhere to ICAPCD rules and regulations. Emission from the construction and operation are required to be within the allowable thresholds established to protect public health and standard mitigation measures including dust control measures have been incorporated into the project design. In summary, air emissions will be reduced, mitigated, or eliminated as required to obtain all required permits from the ICAPCD.

197 Imperial County Transportation Commission. 2022. "Update to the Long Range Transportation Plan". https://www.imperialctc.org/projects/long-range-transportation-plan-update.

In addition, air monitoring activities are occurring in the region through the efforts of state agencies such as the California Air Resources Board[198, 199] and local agencies and community organizations.[200, 201]

Chemical Use

Chemical use and the transportation of materials into the facilities were identified to be similar to the chemicals used for the geothermal operations that have been in operation in the area for the last 40 years.[202] While exact processes and chemical use will be specific to the technologies used at each facility for recovery and final processing of lithium products, generally speaking, DLE is described by experts as requiring sodium carbonate and hydrochloric acid. The EnergySource Minerals Project ATLiS EIR noted hydrochloric acid and bulk reagent chemicals will be brought on site and used for lithium recovery and processing. As discussed in the section on traffic, materials will be transported to and from the projects in trucks. All transportation activities must comply with existing legal requirements for safety and addressing environmental impacts. Also, scientists and project developers providing information during Blue Ribbon Commission meetings explained geothermal brine processing will occur within pipelines and tanks.[203, 204, 205]

198 California Air Resources Board. Community Air Monitoring Plan and Community Emissions Reduction Program. 2018. "Calexico, El Centro, Heber." https://ww2.arb.ca.gov/our-work/programs/community-air-protection-program/communities/calexico-el-centro-heber.

199 California Air Resources Board. Community Air Monitoring Plan and Community Emissions Reduction Program. 2019. "Eastern Coachella Valley." https://ww2.arb.ca.gov/our-work/programs/community-air-protection-program/communities/eastern-coachella-valley.

200 Comite Civico Del Valle and Imperial County Air Pollution Control District. 2019. "Imperial County Community AB617 Self Nomination Imperial County Northern Corridor." https://ww2.arb.ca.gov/sites/default/files/2019-11/2019%2010%2023%20ICAPCD%20CCV%20Northend%20Nomination.pdf.

201 Imperial County, Planning & Development Services Department. 2021. "Project Report." https://www.icpds.com/assets/hearings/02.-WSA,FIER,-MMRP,-CUP20-0008,-PM02485-Energy-Source-Mineral-ATLiS-PC-Pkg.pdf.

202 Blue Ribbon Commission. 2022. "Transcript of the June 30, 2022, Blue Ribbon Commission Meeting." Pages 44–45. https://efiling.energy.ca.gov/GetDocument.aspx?tn=244229&DocumentContentId=78154.

203 Blue Ribbon Commission. 2021. "Transcript of the November 17, 2022 Blue Ribbon Commission Meeting Community Forum." Page 85. https://efiling.energy.ca.gov/GetDocument.aspx?tn=240766&DocumentContentId=74208.

204 Blue Ribbon Commission. 2022. "Transcript of the June 30, 2022, Blue Ribbon Commission Meeting." Page 26. https://efiling.energy.ca.gov/GetDocument.aspx?tn=244229&DocumentContentId=78154.

205 Blue Ribbon Commission. 2021. "Presentation for the July 29, 2021, Blue Ribbon Commission Meeting." Slides 43-45. https://efiling.energy.ca.gov/GetDocument.aspx?tn=239214&DocumentContentId=72666.

Waste Streams

Waste streams are another topic of particular interest to the community. Again, the Commission relied on information in the EnergySource Minerals Project ATLiS EIR and information presented at Commission meetings to explore the waste streams from the DLE facilities as well as any risks to the community.[206, 207] From all information received, the Blue Ribbon Commission understands that the existing regulatory frameworks provide for proper handling and management of wastes with the oversight of local and state agencies to monitor and verify compliance.[208, 209, 210] At the local level, Imperial County Agencies and Departments oversee solid waste facilities and haulers and at the state level the California Department of Resource, Recycling and Recovery oversees solid waste management and the Department of Toxic Substances Control is the authority for hazardous waste regulations and compliance activities. Nonhazardous solid waste is expected to be nominal and will be picked up by local contractors and transported to local waste disposal facilities. Iron-silica material in the form of filter cakes will also be generated from the facility, tested for toxicity, and properly managed.[211] Comments received during public meetings emphasized the need to ensure that new facilities adopt a circular economy (cradle-to-cradle) approach when considering operations and wastes. Experts on DLE technologies noted there may be additional recycling and reuse opportunities when considering all the products, by-products, and wastes produced through the operation of lithium recovery and geothermal facilities and encouraged project developers to continue to innovate and research potential improvements. The Blue Ribbon Commission agrees that developers should implement best practices for all materials and waste management and that the agencies tasked with overseeing the wastes from lithium recovery facilities should ensure the best practices are employed at each facility.

Water Use and Wastewater

Water use and wastewater associated with the construction and operation of lithium recovery facilities planned and under construction were also explored, including consideration of the brine usage and any additional water delivered to the site for project operations. No water

206 Blue Ribbon Commission. 2022. "Transcript of the June 30, 2022 Blue Ribbon Commission Meeting." https://efiling.energy.ca.gov/GetDocument.aspx?tn=244229&DocumentContentId=78154.

207 Blue Ribbon Commission. 2021. "Transcript of the July 29, 2021 Blue Ribbon Commission Meeting." https://efiling.energy.ca.gov/GetDocument.aspx?tn=239800&DocumentContentId=73245.

208 Blue Ribbon Commission. August 26, 2021. "Transcript of the August 26, 2021 Blue Ribbon Commission Meeting." https://efiling.energy.ca.gov/GetDocument.aspx?tn=240014&DocumentContentId=73462.

209 Blue Ribbon Commission. 2021. "Transcript of the October 28, 2021 Blue Ribbon Commission Meeting." https://efiling.energy.ca.gov/GetDocument.aspx?tn=240735&DocumentContentId=74139.

210 Blue Ribbon Commission. 2022. "Transcript of the March 24, 2022 Blue Ribbon Commission Meeting." https://efiling.energy.ca.gov/GetDocument.aspx?tn=242568&DocumentContentId=76086.

211 Blue Ribbon Commission. 2022. "Transcript of the June 30, 2022 Blue Ribbon Commission Meeting." Pages 53-54. https://efiling.energy.ca.gov/GetDocument.aspx?tn=244229&DocumentContentId=78154

from the Salton Sea will be used for the projects proposed by EnergySource Minerals, CTR, or BHE Renewables.[212, 213, 214]

Geothermal Brine

As discussed above, Imperial Valley has a long history of geothermal power production, and the addition of lithium recovery to existing facilities adds additional steps that removes minerals from the brine, but otherwise does not alter the process employed in existing geothermal facilities to bring the brine to the surface and return the brine to the geothermal reservoir. Scientists have studied and continue to study the geothermal reservoir volume, potential energy, and mineral resources. Based on previous studies, experts estimate that the reservoir can sustainably support the planned addition of new lithium recovery and geothermal facilities.[215] As mentioned earlier in this report, with support from DOE's Geothermal Technologies Office, scientists from Lawrence Berkeley National Laboratory (Berkeley Lab), UC Riverside, and Geologica Geothermal Group, Inc. are collaborating to quantify and characterize the lithium in the Salton Sea geothermal reservoir.[216]

Delivered Water

Water use is a primary concern for the region and the state, particularly during the current drought and water supply, water quality concerns, and the regional impacts of the receding Salton Sea. During public meetings, IID representatives described the unprecedented conditions the district is facing and the updated water management planning that has begun to address the shortages and impacts due to prolonged drought conditions.[217] While necessary planning is not complete, it was clear that all new projects seeking water allocations and current water users will be involved in any solutions needed to address limited supplies. IID completes water supply assessment when certain new projects seek an allocation of water in

212 "Final Environmental Impact Report for the EnergySource Mineral ATLiS Project." In Imperial County, Planning & Development Services Department. 2021. Project Report. https://www.icpds.com/assets/hearings/02.-WSA,FIER,-MMRP,-CUP20-0008,-PM02485-Energy-Source-Mineral-ATLiS-PC-Pkg.pdf.

213 Blue Ribbon Commission. 2021. "Transcript of the November 17, 2021 Blue Ribbon Commission Meeting Community Forum." Pages 132–133. https://efiling.energy.ca.gov/GetDocument.aspx?tn=240766&DocumentContentId=74208.

214 Imperial County. 2021. "Planning & Development Services Department Water Supply Assessment." In Project Report. Pages 59-61. https://www.icpds.com/assets/hearings/02.-WSA,FIER,-MMRP,-CUP20-0008,-PM02485-Energy-Source-Mineral-ATLiS-PC-Pkg.pdf.

215 McKibben, Michael and Patrick Dobson. 2022. "Lithium Resources beneath the Salton Sea Presentation for the Salton Sea Summit." CEC Docket 20-LITHIUM-01. TN#: 239363. https://efiling.energy.ca.gov/GetDocument.aspx?tn=239363&DocumentContentId=72808

216 Julie Chao. "Quantifying California's Lithium Valley: Can It Power Our EV Revolution?" Berkeley Lab News Center. February 16, 2022. https://newscenter.lbl.gov/2022/02/16/quantifying-californias-lithium-valley-can-it-power-our-ev-revolution/

217 Blue Ribbon Commission. 2022. "Transcript of the June 16, 2022, Blue Ribbon Commission Meeting." Pages 110 -124. https://efiling.energy.ca.gov/GetDocument.aspx?tn=243846&DocumentContentId=77784.

coordination with local permitting for construction and operation.[218, 219] IID's Integrated Water Resources Management Plan provides relevant information for consideration in a water supply assessment, and IID provides water to new nonagricultural projects under the terms of the Equitable Distribution Plan and the *Interim Water Supply Policy for Non-Agricultural Projects*.[220]

IID has set aside 25,000 acre-feet per year (AFY) for new, nonagricultural uses, which includes new lithium recovery and geothermal projects. Through September 2021, the EnergySource Minerals Project ATLiS and one other project have received allocations from this set-aside. [221] The EnergySource Minerals Project ATLiS EIR identified that roughly 90,000 gallons per hour or about 3,400 AFY of water will be purchased from IID for cooling water and additional process water. One additional non-lithium project has received an allocation of 1,200 AFY, leaving 20,400 AFY for future lithium recovery and geothermal projects from the 25,000 AFY set aside under the *Interim Water Supply Policy for Non-Agricultural Projects*.[222]

Water demand will vary depending on the project; however, the Blue Ribbon Commission understands that if the 3,400 AFY water use of the EnergySource Minerals Project ATLiS were used as a representative amount of the water demand required for the production of approximately 16,700 metric tons of lithium carbonate equivalent products, the entire remaining balance of the IID nonagricultural set-aside could support roughly 100,200 metric tons of lithium carbonate equivalent production per year, including associated lithium chloride recovery. Planned facilities have projected as much as 210,000 metric tons of lithium carbonate equivalent production with expansions in the future. This rough comparison indicates the potential new project requirements for water are greater than the water available for new uses and if actual demand for water for new development exceeds that set aside for these uses, water availability could present limitations for the amount of new lithium recovery and geothermal development approved. However, this rough comparison assumes that water use in all new facilities would be comparable to that identified for the EnergySource Minerals Project ATLiS which may not be an accurate assumption. The comparison provides a potential scenario and actual water use will be better understood when each project completes permitting and CEQA activities.

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218 Projects that meet the criteria of Water Code Sections 10910-10915, as described in Imperial Irrigation District. 2022. "IID Interim Water Supply Policy for Non-Agricultural Projects." https://www.iid.com/home/showdocument?id=9599.

219 Imperial Irrigation District. 2022. "IID Interim Water Supply Policy for Non-Agricultural Projects." https://www.iid.com/home/showdocument?id=9599.https://www.iid.com/home/showdocument?id=9599.

220 Imperial Irrigation District. 2012. "Imperial Integrated Regional Water Management Plan." https://www.iid.com/water/water-supply/water-plans/imperial-integrated-regional-water-management-plan.

221 Water Supply Assessment, pages 59–60. In Imperial County, Planning & Development Services Department. 2021. "Project Report." https://www.icpds.com/assets/hearings/02.-WSA,FIER,-MMRP,-CUP20-0008,-PM02485-Energy-Source-Mineral-ATLiS-PC-Pkg.pdf.

222 Water Supply Assessment, page 32. In Imperial County, Planning & Development Services Department. 2021. "Project Report." https://www.icpds.com/assets/hearings/02.-WSA,FIER,-MMRP,-CUP20-0008,-PM02485-Energy-Source-Mineral-ATLiS-PC-Pkg.pdf.

Wastewater

Information provided to the Commission demonstrated that there will be minimal wastewater produced from lithium recovery operations and that wastewater will be managed either on site or through municipal systems with oversight from appropriate local and state agencies. The Commission heard that there may be opportunities for water efficiency improvements in facility design and encourages all efforts to capture and reuse or recycle any wastewater produced at geothermal and lithium recovery facilities.[223]

In summary, the Blue Ribbon Commission explored a wide range of potential environmental impacts associated with planned lithium recovery facilities, a portion of which are described here, and generally found that requirements of CEQA and other assessments that are required for permitting new facilities will provide information about potential impacts, require mitigation, or advance mitigation, of potentially significant impacts, and offer an opportunity for the community to understand and comment on the specific details of each planned facility.

The Blue Ribbon Commission finds that while the topics required to be considered under CEQA are intended to support a robust review of proposed projects, CEQA also offers an opportunity to expand evaluations. Many stakeholders advocated that CEQA should be considered the floor and not the ceiling when it comes to ensuring a comprehensive review of project impacts and providing a transparent and inclusive process for Tribal and community participation. In addition, the current and historical context and conditions of the region are critical for project developers and permitting agencies to consider for future geothermal and lithium-related development projects. Furthermore, the Commission identified that water availability is a consideration for future project development that could present limitations on future development but requires additional project specific details to fully evaluate. The Commission further finds that health impact assessments provide a deeper evaluation of a project's impact on the community. Consistent with findings noted earlier in this report, the discussion of environmental impacts should be coupled with meaningful Tribal and community engagement.

Economic Impacts

The recovery of lithium from geothermal brine using DLE, and the growth of a regional economic hub or cluster that includes additional lithium processing and production of mineral compounds in developing Lithium Valley could lead to substantial economic growth in the region. There may also be additional economic activity associated with the recovery of other minerals from geothermal brine and the development of manufacturing plants that use Imperial County lithium and other minerals from recovered from geothermal brine. However, this analysis focuses on impacts anticipated from DLE from geothermal brine and related processing and production. The three DLE projects in planning and development may generate millions of dollars each year in new revenue, which would lead to increases in funds from royalties, taxes, and service fees that directly benefit state and local governments, landowners, and IID.

According to the Imperial Valley Economic Development Corporation's (IVEDC) Economic Impact Assessment, every $1 spent on payroll at the colocated geothermal power plants and

223 Blue Ribbon Commission. 2022. "Transcript of June 30, 2022 Blue Ribbon Commission Meeting." Pages 55, 64–66. https://efiling.energy.ca.gov/GetDocument.aspx?tn=244229&DocumentContentId=78154.

lithium recovery facilities proposed by CTR would generate an additional $1.23 for the community in local taxes and earnings. If all planned phases are completed, the estimated local impact would be 4,285 jobs created and $359.3 million in annual earnings and taxes.[224]

In May 2022, Imperial County estimated the combination of geothermal energy and recovery of minerals from geothermal brine could double Imperial County's gross domestic product in the next 5–10 years.[225] Energy Source noted that "the project will provide $23 million annually in taxes and fees that will be used for public schools, social services, road repair and police and fire. We will also provide $18 million in payroll and local services each year as well as $2.5 million in local infrastructure improvements.[226]

As noted above, the fiscal year 2022–2023 state budget, enacted in June 2022, created a new, tiered excise tax on lithium recovery in California starting at $400 per ton for 20,000 tons or less, $600 per ton for 20,000 to 30,000 tons, and $800 per ton for more than 30,000 tons with requirements that 80 percent of the revenues from this tax are distributed to the communities where the lithium was extracted. Based on DLE facility lithium recovery and production estimates, this tax could lead to new revenues in Imperial County of up to $19 million per year starting in 2024 and increasing over time with dramatic increases possible if all planned facilities are ultimately developed. In addition, this new authority requires that no less than 30 percent of the funds provided to Imperial County from moneys collected under the new tax be distributed to the communities in Imperial County that are most directly and indirectly impacted by lithium recovery activities.

Although the actual amount of new investment and revenue created for the region is unknown, the region can expect new jobs directly associated with lithium recovery and geothermal power production, new tax revenue, new service jobs, and business opportunities from the overall increase in economic activity as well as infrastructure investments. Anticipated growth in the economy and individuals' income levels will lead to additional economic growth for both existing and new businesses throughout the region, as well as tax revenues for local governments and the state.

The Blue Ribbon Commission finds that effective and inclusive budgeting and planning for future economic growth is imperative to ensuring local hiring and education and skills readiness for residents to take advantage of the anticipated economic opportunities. The *Lithium Valley Economic Opportunity Investment Plan*,[227] approved by the Imperial County Board of Supervisors in February 2022, provides, in part, the county's summary of anticipated local benefits of lithium recovery activities. Moreover, the plan includes specific actions

224 IVEDC: Controlled Thermal Resources Hell's Kitchen Lithium and Power Project — Economic Impact Analysis. As cited in New Energy Nexus. 2020. *Building Lithium Valley.* Pages 22–23. https://www.newenergynexus.com/wp-content/uploads/2020/10/New-Energy-Nexus_Building-Lithium-Valley.pdf.

225 Rebecca Terrazas, Director, Imperial County Intergovernmental Relations. 2022. "Presentation for the Economic Impacts Workshop. In Blue Ribbon Commission. "Transcript of the May 12, 2022, Meeting." Page 144. https://efiling.energy.ca.gov/GetDocument.aspx?tn=243477&DocumentContentId=77306.

226 EnergySource Minerals. October 27, 2022. "Comments on Lithium Valley Commission Report." https://efiling.energy.ca.gov/GetDocument.aspx?tn=247059&DocumentContentId=81417.

227 Imperial County. 2022. "Lithium Valley Economic Opportunity Investment Plan." Imperial County. https://lithiumvalley.imperialcounty.org/wp-content/uploads/2022/02/LithiumValleyInvestmentPlanLVIP-FINAL-Watermark.pdf.

requested of the State of California including providing direct funding to Imperial County to develop a *Lithium Valley Specific Plan* and Programmatic EIR, which was included in the fiscal year 2022–2023 state budget.

Imperial County describes in the *Lithium Valley Economic Opportunity Investment Plan*, that the Specific Plan's goal is to expand renewable energy development opportunities including geothermal energy, mineral recovery, and renewable manufacturing facilities such as cathode,[228] battery, and EV facilities.[229] They further note that the Programmatic EIR would ensure CEQA requirements and environmental impacts are considered over the large project area and would assist developers by avoiding duplication in CEQA requirements by individual projects. A Programmatic EIR is an EIR prepared for a series of actions that can be characterized as one large project. The actions are related either: 1) geographically; 2) as logical parts in the chain of contemplated actions; 3) in connection with issuance of rules; regulations, plans, or other general criteria to govern the conduct of a continuing program; or 4) as individual activities carried out under the same authorizing statutory or regulatory authority, and having generally similar environmental effects which can be mitigated in a similar way.[230] California Code of Regulations, Section 15168(b) states the advantages of a Programmatic EIR can be:

> "(1) Provide an occasion for a more exhaustive consideration of effects and alternatives than would be practical in an EIR on an individual action,
>
> (2) Ensure consideration of cumulative impacts that might be slighted in a case-by-case analysis,
>
> (3) Avoid duplicative reconsideration of basic policy considerations,
>
> (4) Allow the lead agency to consider broad policy alternatives and program wide mitigation measures at an early time when the agency has greater flexibility to deal with basic problems or cumulative impacts,
>
> (5) Allow reduction in paperwork."

As noted above, the fiscal year 2022–2023 state budget provides Imperial County with $5 million, of which $3.8 million is provided to the county for a Programmatic EIR and a health impact assessment. State budget funding also supports community outreach for geothermal

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228 Comments on the draft report from Lawrence Berkeley National Laboratory included support for colocation of cathode manufacturing with facilities to recover minerals from geothermal brine: "Battery cathodes that rely on manganese instead of cobalt as a redox active transition metal could utilize both lithium and manganese from the same geothermal resource. Given the similar technology readiness levels for large scale lithium extraction processes and next-generation lithium batteries, we recommend investigating co-development as a means to holistically assess project impact and leverage market synergy." Whittaker, Michael. October 28, 2022. "Berkeley Lab Comment on Draft Report of the Blue Ribbon Commission on Lithium Extraction in California." Lawrence Berkeley National Laboratory.
https://efiling.energy.ca.gov/GetDocument.aspx?tn=247091&DocumentContentId=81500.

229 Imperial County. 2022. "Lithium Valley Economic Opportunity Investment Plan." Imperial County. https://lithiumvalley.imperialcounty.org/wp-content/uploads/2022/02/LithiumValleyInvestmentPlanLVIP-FINAL-Watermark.pdf

230 California Code of Regulations, Section 15168.

energy development and lithium recovery, processing and production, and related manufacturing activities within the county.

On July 26, 2022, the Imperial County Board of Supervisors approved a contract with Dudek Consulting to prepare the Salton Sea Renewable Resource Specific Plan and Programmatic EIR and the Lithium Development Infrastructure Assessment. The intent of these planning documents is described consistently with the descriptions in the *Lithium Valley Economic Opportunity Investment Plan.* The infrastructure assessment was also described, as detailed below:

> The Salton Sea Renewable Resource Specific Plan will develop an infrastructure plan. The goal is [to] develop both a macro and micro utility plan. Due to the vast area of the Specific Plan micro grids (campus power), utilizing onsite/adjacent power generation as the primary source reduces the demand for larger power grids, reducing development costs. A linking macro grid will also be developed providing both export and import of power to the micro grid. Potable water, bulk water, onsite, micro, and regional wastewater treatment facilities.[231]

The county has taken initial steps to establish an enhanced infrastructure finance district and plan to support infrastructure projects, including transportation infrastructure, community economic development, and climate adaptation projects.[232] Community members have expressed the need for more robust community conversations and engagement by project developers and Imperial County. Tribal representatives have also expressed that the consultation to date has not been adequate. The Blue Ribbon Commission finds that additional community engagement and Tribal consultation are essential to better ensure realization of community benefits and priorities from private and public local and regional investment. Furthermore, the Commission finds that community-based organizations play a critical role in cultivating community capacity to participate in and inform decision-making processes that meet community needs.

The Blue Ribbon Commission learned that community benefits agreements between community organizations or Tribes and project developers are an effective tool to address community and Tribal priorities, reduce impacts, and ensure that economic gains from these projects are shared with the residents of the region by dedicating funds to address community-identified priorities.[233] The Commission finds successful community benefits agreements are legally enforceable, contain clear commitments in a governing document, have ongoing monitoring mechanisms, community oversight and accountability, and provide a forum for collaborative problem-solving and durability.[234] Industry has also expressed that

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231 Imperial County. 2022. Board Agenda Fact Sheet (specific to request to consider and award contract to Dudek [continuing]. Identified by Agenda as Item 17). Pages 80-83. https://imperial.granicus.com/MetaViewer.php?view_id=2&clip_id=2184&meta_id=367021.

232 Blue Ribbon Commission. 2022. "Workforce Development Workshop Draft Proposed Findings and Recommendations." https://efiling.energy.ca.gov/GetDocument.aspx?tn=242291&DocumentContentId=75795.

233 Blue Ribbon Commission. 2022. "Draft Preliminary Proposed Economic Impact Findings and Recommendations." https://efiling.energy.ca.gov/GetDocument.aspx?tn=243298&DocumentContentId=76987.

234 Blue Ribbon Commission. 2022. "Transcript of May 12, 2022, Blue Ribbon Commission Meeting." https://efiling.energy.ca.gov/GetDocument.aspx?tn=243477&DocumentContentId=77306.

additional burdens and delays could hinder the growth of this nascent industry given the global competitiveness.

Workforce

Developing a local workforce was a high-priority topic of exploration for the Blue Ribbon Commission. CTR and BHE Renewables each provided information about the hiring goals and anticipated workforce needs for their planned facilities and EnergySource Minerals workforce estimates were provided in the final EIR prepared for the EnergySource Minerals Project ATLiS.[235, 236] During the Blue Ribbon Commission meetings, representative of these developers have all conveyed their commitment to supporting development of a local workforce and emphasized that the success of their facilities depends on building and maintaining a local workforce.

The Blue Ribbon Commission heard from workforce development, labor, and academic professionals that coordination, commitment, and investment are needed to support development of "High Road Jobs and Careers." At the December 16, 2021, meeting, we learned that the California Workforce Development Board is advancing the "High Road," which is a set of economic and workforce development strategies to achieve economic growth, economic equity, shared prosperity, and a clean environment. The California Workforce Development Board's High Road approach focuses on High Road Training Partnerships and High Road Construction Careers. High Road Construction Careers use established preapprenticeship training, offer support services, and provide career placement.[237] In addition, at the February 24, 2022, Blue Ribbon Commission meeting, Carol Zabin further explained that "a High Road Job" is one that provides job quality, wages sufficient to support a family, high health and safety standards, career pathways, and worker protections.[238] Also, the Blue Ribbon Commission heard that creating High Road Jobs for local residents will require sustained communication with local community organizations, labor groups, academic institutions, and public agencies.

At Commission meetings, residents from communities in the Salton Sea region have expressed concern that they will be left behind or excluded from participating in educational and employment opportunities and economic growth that results from lithium development.[239] Community representatives also shared interest in ensuring that training programs result in real jobs for local residents.

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235 Blue Ribbon Commission. February 24, 2022. "Presentation – Convening of the Lithium Valley Commission 02-24-22." https://efiling.energy.ca.gov/GetDocument.aspx?tn=241964&DocumentContentId=75644.

236 Imperial County, Planning and Development Services Department. 2021. Project Report. https://www.icpds.com/assets/hearings/02.-WSA,FIER,-MMRP,-CUP20-0008,-PM02485-Energy-Source-Mineral-ATLiS-PC-Pkg.pdf.

237 Blue Ribbon Commission. 2022. "Transcript of the December 16, 2021, Blue Ribbon Commission Meeting." https://efiling.energy.ca.gov/GetDocument.aspx?tn=241527&DocumentContentId=75491.

238 Blue Ribbon Commission. 2022. "Transcript of the February 24, 2022, Blue Ribbon Commission Meeting." https://efiling.energy.ca.gov/GetDocument.aspx?tn=242478&DocumentContentId=75981.

239 Blue Ribbon Commission. 2022. "Transcript of the February 24, 2022, Blue Ribbon Commission Meeting." https://efiling.energy.ca.gov/GetDocument.aspx?tn=242478&DocumentContentId=75981.

Local educational institutions, such as Imperial Valley College, have started to develop classes and training to prepare local residents for the anticipated hiring for these projects, including increasing science, technology, engineering, and mathematics programs at all grade levels and developing new vocational and certificate programs. The project developers represented they:

- Have established relationships with the schools in the area to guide and support new program development.
- Are working with labor unions to establish project labor agreements and apprenticeship programs.
- Are working with training and development agencies to develop programs and provide funding to train residents in the vocational skills needed for geothermal and lithium recovery related jobs.

For example, Imperial Valley College is launching three certificate programs in fall 2023 to prepare students for jobs using DLE technologies. Also, Imperial County school districts are developing regional occupational programs and other programs to develop pathways for students to have the skill sets necessary to work in DLE facilities, such as dual enrollment for students to enroll in a certification program at Imperial Valley College while still in high school.[240]

The fiscal year 2022–2023 state budget also provided $80 million to support development of the San Diego State University, Brawley Center, to expand academic opportunities for the region. At the federal level, the U.S. Department of Energy, U.S. Department of Labor, and the AFL-CIO are partnering on pilot programs to train battery manufacturing workers.[241]

The Blue Ribbon Commission finds it is imperative that new geothermal lithium recovery and related projects prioritize development and hiring of a local workforce, provide resources to support development of necessary training and educational opportunities, and commit to requirements for strong workforce and labor standards that produce high-quality jobs and careers. The Commission further finds that educational programs and initiatives have begun. However, more work must be done to have a thorough understanding of the anticipated job opportunities and develop local residents to fill job opportunities now and in the future. The Commission also recognizes that training means good academic programs at all levels, including vocational training and apprenticeship programs. Further, the Commission finds that equitable access to education and training requires more than creating a supply of classes and training programs, but also ensuring access by providing childcare services, public transportation, infrastructure improvements, investments in technology, and development of various methods to deliver courses, training, and educational programs. Finally, project labor agreements as a parallel to, or included in, community benefits agreements are an effective tool to ensure necessary programs are developed and maintained.

240 Simon Canales (Brawley Union High School District). 2022. "Transcript of the July 21, 2022, Blue Ribbon Commission Meeting." P. 178. https://efiling.energy.ca.gov/GetDocument.aspx?tn=245784&DocumentContentId=79989.

241 U.S. Department of Energy. 2022. "DOE Announces $5 Million to Launch Lithium-Battery Workforce Initiative." https://www.energy.gov/articles/doe-announces-5-million-launch-lithium-battery-workforce-initiative.

G. The Importance of, and Opportunities for, the Application of Local, State, and Federal Incentives and Investments to Facilitate Lithium Extraction from Geothermal Brines

We are aware that the lithium industry is ready to deploy and could meet ambitious timelines, and from an industry perspective, it is imperative that government prioritizes development activities in the same way that other green energy industries like solar and wind projects have been prioritized for many years. Local, state, and federal assistance is necessary to support the growth of DLE from geothermal brines in the Salton Sea KGRA and the development of the Salton Sea region to support the growth of lithium recovery.

The CEC has provided research and demonstration grant funding to all three of the current lithium recovery project developers working on facilities in Imperial County, as well as others that have explored minerals recovery from geothermal brine. For example, the CEC previously provided grant funding as follows:

- Approximately $4.5 million to Hell's Kitchen Geothermal, LLC, for projects to develop and demonstrate improved processes to remove silica and heavy metals and prepare geothermal brine for recovery of lithium;
- $6 million to BHE Renewables,[242] LLC, to demonstrate an integrated system that includes geothermal brine pretreatment and lithium recovery; and,
- $2.5 million to EnergySource Minerals, LLC, to develop a robust engineering package and accurate capital budget for a facility to recover lithium and other minerals from geothermal brine, using processes and equipment previously used in the water treatment, metal processing, and chemical processing industries.[243]

In addition, the CEC has awarded Electric Program Investment Charge and Clean Transportation Program funding for projects on vehicle and battery manufacturing, battery efficiency and safety, lithium-ion battery recycling, and lithium-ion battery reuse.[244] Looking ahead, as projects move from demonstration into commercial-scale operations, necessary financial support could include funding critical areas of additional research, as well as incentives and investments that support the launch, adoption, and growth of lithium recovery facilities.

The state acts through many agencies and offices to implement a large array of economic, business and employment development programs that can contribute to building a hub of economic activity centered in the Imperial Valley. Among these are the Governor's Office of Business & Economic Development (GO-Biz), which supports businesses and economic development practitioners to understand and navigate resources and programs, and the California Infrastructure Bank (IBank), which provides loans for infrastructure projects, issues

242 BHER Minerals is the party identified as the grant recipients on CEC documents. BHER Minerals is a closely related entity to BHE Renewables and to avoid confusion the more general, affiliated company reference has been used in this report.

243 Blue Ribbon Commission. 2021. "Resource List for July 29, 2021, Blue Ribbon Commission Meeting." https://efiling.energy.ca.gov/GetDocument.aspx?tn=239033&DocumentContentId=72467.

244 Blue Ribbon Commission. 2021. "Project List for September 30, 2021, Blue Ribbon Commission Meeting." https://efiling.energy.ca.gov/GetDocument.aspx?tn=239860&DocumentContentId=73299.

bonds, and provides loan guarantees that support small business. Representatives from these and other agencies assisted the Blue Ribbon Commission in building an understanding of existing opportunities and potential new funding and tax mechanisms that will advance lithium recovery from geothermal brines.

In addition to state programs, federal funding is also available to support activities related to the development of lithium recovery and lithium-dependent manufacturing businesses. While there are many opportunities, one example is U.S. Department of Energy grants available for battery material processing and battery manufacturing and recycling. Scoring criteria for these and other federal funding programs emphasize community impact and U.S. Department of Energy is working to be responsive to comments from underserved and overburdened communities. The Federal Interagency Working Group on Coal and Power Plant Communities and Economic Revitalization created an online clearinghouse for information on federal funding opportunities for communities. The funding clearinghouse is available online at https://energycommunities.gov/. In addition, the recently federally approved Inflation Reduction Act of 2022 (H.R. 5376), and the Infrastructure Investment and Jobs Act of 2021 (H.R. 3684), include opportunities for both infrastructure and clean energy investment in the Salton Sea region.[245] [246]

Through the Inflation Reduction Act of 2022 (IRA), the federal government continues to take action to incentivize increased commercial scale development of renewable energy projects. The investments under the IRA are expected to have far-reaching impacts to advance California's and the nation's climate and clean energy goals. Most pertinent to the work of this Commission is the IRA extension of the investment tax credit (ITC) for specified electricity generating facilities, including geothermal power plants. Equally pertinent are the new clean vehicle credit eligibility requirements. To be eligible for the credit, EVs must contain a specified percentage of critical minerals, such as lithium, and battery components from the United States or other eligible countries.[247], [248] A state commitment, through policies and related administrative action, to provide a timely and efficient permitting pathway for development of geothermal power plants and DLE facilities in the Salton Sea KGRA region, can position the region and state to significantly benefit from the IRA.

The Blue Ribbon Commission finds there is a broad array of existing programs and financing structures that could assist economic development in the Imperial Valley. To properly access these tools, an experienced, local representative needs to be engaged with state and federal agencies. The inclusion of funding in the fiscal year 2022–2023 state budget for Imperial

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245 U.S. Congress. 2021. "Infrastructure Investment and Jobs Act." H.R. 3684 – 117th Congress. https://www.congress.gov/bill/117th-congress/house-bill/3684/text.

246 U.S. Congress. 2022. "Inflation Reduction Act of 2022." H.R. 5376 – 117th Congress. https://www.congress.gov/bill/117th-congress/house-bill/5376/text?q=%7B%22search%22%3A%5B%22inflation+reduction+act%22%2C%22inflation%22%2C%22reduction%22%2C%22act%22%5D%7D&r=1&s=2.

247 H.R.5376 - Inflation Reduction Act of 2022. 117th Congress (2021-2022). Section 45X(c)(6) lists the critical minerals subject to this requirement, such as lithium carbonate and lithium hydroxide.

248 Regarding critical materials, the percentages apply to 1) critical minerals extracted/processed in the United States, or in a country that has a free trade agreement with the United States in effect; or 2) critical minerals recycled in North America.

County to create an ombudsman position is an initial step to help local, lithium-related entrepreneurs and businesses identify potential incentives and competitive funding opportunities from state and federal government.

The Blue Ribbon Commission also finds that infrastructure investments are being prioritized by Imperial County because strong infrastructure is needed to support development of lithium recovery and processing, as well as related industrial development. Local entities including the newly funded county ombudsman can identify and seek support from existing state and federal funding programs, but these efforts will require maintaining a strong collaboration between the county and state. Investments and incentives to encourage lithium-related product manufacturing to locate near the Imperial Valley source of lithium will support long-term viability of local lithium recovery and production. Furthermore, establishing a financial structure that invests in developing circular economy opportunities[249] and provides incentives for participation by product owners would benefit the overall lithium-based economy in California.

The Commission also notes that providing access to existing resources and programs is critical to encouraging the indirect growth opportunities for local economies in the Salton Sea region. Moreover, consistent with the report recommendations, the design of any state incentive and investment program that supports the development of lithium recovery and related businesses should include requirements that funding recipients and projects provide direct community benefits, encourage inclusive community engagement, and support local hiring and educational opportunities.

H. Recommendations for Legislative or Regulatory Changes That May be Needed to Encourage Lithium Extraction from Geothermal Brines, Including Whether the Development of a Centralized Tracking System for Lithium Project Permitting by State and Local Regulatory Agencies Would Assist with Development of the Lithium Industry

AB 1657 directed the Blue Ribbon Commission to explore the need for a centralized tracking system for lithium project permitting by state and local regulatory agencies to assist with development of the lithium industry.

The Commission found that the environmental review, permitting, mitigation, and monitoring data related to geothermal/lithium projects are not located in a single, accessible location. Project developers did not express a need for a centralized tracking system. However, we found that community, environmental justice, and Tribal representatives supported the development of a data portal or centralized location for more easily accessible information on DLE projects and related development in the region.

249 When EV batteries exhaust their ability to power vehicles, they still contain useful amounts of lithium and other elements. Innovation is needed to improve technology and design for recovery, reuse, and recycling of lithium-ion batteries. Los Angeles County Solid Waste Management Committee/Integrated Waste Management Task Force. October 26, 2022. "Comments on Draft Report of the Blue Ribbon Commission on Lithium Extraction in California." https://efiling.energy.ca.gov/GetDocument.aspx?tn=246907&DocumentContentId=81262.

CHAPTER 5:
Commission Recommendations

There is a sustained effort underway in California to seed a high-road economy centered on the recovery of lithium and other minerals in the Salton Sea's Known Geothermal Resource Area. If done correctly, this effort will be a once-in-a-generation opportunity with tremendous potential for transformative economic growth that could bring family-sustaining jobs and real economic opportunities to California's most underserved residents.

The Blue Ribbon Commission held over 23 public meetings — including several focused on soliciting input from local communities and Tribes — as part of its work to review, investigate, and analyze issues relating to plans for geothermal lithium recovery near the communities of Calipatria and Niland in Imperial County. This report to the Legislature provides findings and recommendations for resources, research, health impact assessments, information sharing, planning, infrastructure, high-road job and career approaches, project labor agreements, community benefits agreements, oversight, monitoring, technical assistance, and Tribal and community engagement. To have a chance at capturing the benefits of lithium recovery, the region needs continued engagement and investment aligned with the needs of residents and assets of this region.

On November 17, 2022, the Commission considered and took action to finalize its report, including consideration of 20 recommendations.[250] Of the recommendations considered, 15 recommendations were adopted by the Commission, and five recommendations were considered but not adopted.[251]

Table 1 documents the 15 recommendations adopted by the Commission on November 17, 2022. Table 2 documents the recommendations not adopted by the Commission.

250 Blue Ribbon Commission. 2022. "Transcript of the November 17, 2022, Meeting." https://efiling.energy.ca.gov/GetDocument.aspx?tn=247803.

251 Approval or adoption of an item by the Commission requires a majority vote, which is 8 out of 14 possible votes, as established in the Rules of Order adopted by the Commission at the April 29, 2021, meeting. The Rules of Order are available online in the following document: Blue Ribbon Commission. April 22, 2021. Proposed Rules of Order. https://efiling.energy.ca.gov/GetDocument.aspx?tn=237524&DocumentContentId=70728.

Table 1: Recommendations Adopted by the Commission on November 17, 2022

Item	Statutory Topics	Recommendation	Action Taken
	Permitting		
1.	• Market Opportunities • Legislative or Regulatory Changes	Establish a Lithium Valley priority permitting process that includes additional resources for agency action on applications for geothermal, DLE, and related manufacturing, production, or assembly projects identified by the state as essential to the development and growth of Lithium Valley.	Vote: Yes = 9, No = 0; Abstain = 0; Absent = 5 Yes Votes: Commissioners Castaneda, Dolega, Hanks, Kelley, Olmedo, Paz, Reynolds, Ruiz, and Weisgall No Votes: none Abstain: none Absent: Commissioners Colwell, Flores, Lopez, Scott, and Soto
	Transmission Planning and Investment		
2.	• Geothermal Power/Lithium Recovery • Potential Benefits re: Geothermal Facilities/ Grid Stability	Accelerate state planning for investment and upgrades in transmission for geothermal power plants in Imperial Valley to be online in 2024 and over the next decade.	Vote: Yes = 9, No = 0; Abstain = 0; Absent = 5 Yes Votes: Commissioners Castaneda, Dolega, Hanks, Kelley, Olmedo, Paz, Reynolds, Ruiz, and Weisgall No Votes: none Abstain: none Absent: Commissioners Colwell, Flores, Lopez, Scott, and Soto

Item	Statutory Topics	Recommendation	Action Taken
	Economic Development and Incentivizing Investment		
3.	• Opportunities for Incentives/ Investments	Establish the Southeast California Economic Zone, which includes Imperial County and Eastern Coachella and Palo Verde Valleys. This regional economic zone should be recognized by federal, state, and local governments, and eligible to compete for funding and investments. The goals of the regional economic zone should balance representation from labor, business, community, government, Tribes, and other stakeholders. With respect to lithium recovery, investments should be prioritized in the communities closest to geothermal power plants and DLE facilities. Incentives should be provided for direct DLE development, and indirect development, and include incentives for childcare, research and development, and construction and non-construction apprenticeships. Elements of the zone might include tariff relief, credits or incentives for corporate investments, credits for education investment in local workforce and childcare, and research and development, with benefits tied to community benefit agreements, project labor and maintenance agreements, and state-certified apprenticeship and pre-apprenticeship opportunities, and Tribal consultation. The elements of the zone could include, but are not limited to: • Special Economic Zone. Tariff relief for Foreign Direct Investment in the zone (component and technology imports for finished goods manufacturing in the zone). Reducing tariff costs for importing component parts for at least 5 years will allow time to domestically source or create component source in the United States) • Corporate Tax Relief. Reduce the Federal and State Corporate Tax rate for development within the zone to at least 10 years. • Education Incentives – In-State Tuition for Employees. Provide employees and household members of Development Zone Companies in-state tuition without residency time requirement for a term of 10 years. Employees must live and work in the zone. • Enterprise Project. Provide Employment sales tax credit of $5,000 per Full-Time Equivalency per year for capital projects greater than $150,000,000 with a maximum number of 500 FTE per corporate applicant for a term of 10 years.	Vote: Yes = 8, No = 1; Abstain = 0; Absent = 5 Yes Votes: Commissioners Castaneda, Dolega, Kelley, Olmedo, Paz, Reynolds, Ruiz, and Weisgall No Votes: Commissioner Hanks Abstain: none Absent: Commissioners Colwell, Flores, Lopez, Scott, and Soto

Item	Statutory Topics	Recommendation	Action Taken
4.	• Market Opportunities • Opportunities for Incentives/ Investments • Overcoming Technical and Economic Challenges	The State should increase funding – and identify alternative funding sources — for research and development, start-up companies, and expansion of lithium battery and battery component manufacturing and recycling, especially cathode production using lithium produced through environmentally preferable methods.	Vote: Yes = 9, No = 0; Abstain = 0; Absent = 5 Yes Votes: Commissioners Castaneda, Dolega, Hanks, Kelley, Olmedo, Paz, Reynolds, Ruiz, and Weisgall No Votes: none Abstain: none Absent: Commissioners Colwell, Flores, Lopez, Scott, and Soto
5.	• Overcoming Technical and Economic Challenges • Market Opportunities • Potential Economic Impacts	Federal, state, and local governments should foster collaboration across the supply chain of lithium related technologies by creating networks, meetings, and other forums that regularly bring business, research, Tribes, communities, and government agencies together to identify short- and long-term economic opportunities.	Vote: Yes = 9, No = 0; Abstain = 0; Absent = 5 Yes Votes: Commissioners Castaneda, Dolega, Hanks, Kelley, Olmedo, Paz, Reynolds, Ruiz, and Weisgall No Votes: none Abstain: none Absent: Commissioners Colwell, Flores, Lopez, Scott, and Soto
6.	• Opportunities for Incentives/ Investments • Market Opportunities • Community	The State and County should establish a business service center in Imperial County to facilitate access to business development incentive programs to benefit residents of disadvantaged communities, Tribal members, small businesses, and entrepreneurs.	Vote: Yes = 9, No = 0; Abstain = 0; Absent = 5 Yes Votes: Commissioners Castaneda, Dolega, Hanks, Kelley, Olmedo, Paz, Reynolds, Ruiz, and Weisgall No Votes: none Abstain: none Absent: Commissioners Colwell, Flores, Lopez, Scott, and Soto

Item	Statutory Topics	Recommendation	Action Taken
	Circular Economy and Environmentally Sound Sourcing		
7.	• Market Opportunities • Opportunities for Incentives/ Investments • Potential Economic Impacts	Support development of a circular lithium economy based in California, with environmentally responsible sourcing of raw materials, life cycle analysis, requirements for product design that support recovery, reus and recycling of materials, and development of effective recovery infrastructure, built with the assistance of public-private coalitions and effective community engagement.	Vote: Yes = 9, No = 0; Abstain = 0; Absent = 5 Yes Votes: Commissioners Castaneda, Dolega, Hanks, Kelley, Olmedo, Paz, Reynolds, Ruiz, and Weisgall No Votes: none Abstain: none Absent: Commissioners Colwell, Flores, Lopez, Scott, and Soto
	State Agency Initiatives and Programs		
8.	• Community •Safe Environmental Methods and Standards • Environmental Impact	The State should fund a health impact analysis (e.g., assessment or study) for Eastern Coachella Valley, to be carried out by an academic institution or public agency, relating to increased development in the Salton Sea KGRA of geothermal power plants and DLE facilities and related processing, production, and manufacturing activities.	Vote: Yes = 9, No = 0; Abstain = 0; Absent = 5 Yes Votes: Commissioners Castaneda, Dolega, Hanks, Kelley, Olmedo, Paz, Reynolds, Ruiz, and Weisgall No Votes: none Abstain: none Absent: Commissioners Colwell, Flores, Lopez, Scott, and Soto
9.	• Opportunities for Incentives/ Investments • Market Opportunities • Overcoming Technical and Economic Challenges	Provide resources for local and state agencies and Tribes to proactively seek and leverage existing federal funding opportunities to invest in infrastructure in the Salton Sea region, including funding made available through the Infrastructure Investment and Jobs Act of 2021 (H.R. 3684) and the Inflation Reduction Act of 2022 (H.R. 5376).	Vote: Yes = 9, No = 0; Abstain = 0; Absent = 5 Yes Votes: Commissioners Castaneda, Dolega, Hanks, Kelley, Olmedo, Paz, Reynolds, Ruiz, and Weisgall No Votes: none Abstain: none Absent: Commissioners Colwell, Flores, Lopez, Scott, and Soto

Item	Statutory Topics	Recommendation	Action Taken
	Potential Environmental Impacts		
10.	• Potential Environmental Impacts • Safe Environmental Methods and Standards	Require and fund IID to conduct a water study of projected cumulative infrastructure development of geothermal power plants and DLE facilities and related water use, sources, local beneficial uses, and availability. The State or other entity should also evaluate water quality.	Vote: Yes = 8, No = 0; Abstain = 1; Absent = 5 Yes Votes: Commissioners Castaneda, Hanks, Kelley, Olmedo, Paz, Reynolds, Ruiz, and Weisgall No Votes: none Abstain: Commissioner Dolega Absent: Commissioners Colwell, Flores, Lopez, Scott, and Soto
	Workforce Development		
11.	• Potential Economic Impacts • Community	The State should fund (and identify additional funding sources), and the industry should inform, the creation of curriculums, courses, and certification programs in science, technology, engineering, and mathematics (STEM) at schools and colleges to advance critical knowledge and skills across all grade levels, with a focus on the infrastructure and communities closest to geothermal power plants and DLE facilities	Vote: Yes = 9, No = 0; Abstain = 0; Absent = 5 Yes Votes: Commissioners Castaneda, Dolega, Hanks, Kelley, Olmedo, Paz, Reynolds, Ruiz, and Weisgall No Votes: none Abstain: none Absent: Commissioners Colwell, Flores, Lopez, Scott, and Soto
	Community Benefits and Safety		
12.	• Potential Economic and Environmental Impacts • Community	Federal, state, and local government should invest in repairs, improvements to critical infrastructure and housing needed to support the success of lithium recovery, lithium processing, and lithium-dependent product manufacturing and recycling in the Salton Sea region, with a focus on the infrastructure and communities closest to geothermal power plants and DLE facilities. Investment decisions should consider community and Tribal priorities and include opportunities for participatory budgeting that includes public process and community and Tribal involvement.	Vote: Yes = 9, No = 0; Abstain = 0; Absent = 5 Yes Votes: Commissioners Castaneda, Dolega, Hanks, Kelley, Olmedo, Paz, Reynolds, Ruiz, and Weisgall No Votes: none Abstain: none Absent: Commissioners Colwell, Flores, Lopez, Scott, and Soto

Item	Statutory Topics	Recommendation	Action Taken
	Outreach and Engagement		
13.	• Community • Tribal • Potential Economic Impacts	Provide capacity building funds, such as grants, and other resources (e.g., childcare for parents to attend meetings) for Tribes and community members to engage with federal, state, and local permitting agencies.	Vote: Yes = 9, No = 0; Abstain = 0; Absent = 5 Yes Votes: Commissioners Castaneda, Dolega, Hanks, Kelley, Olmedo, Paz, Reynolds, Ruiz, and Weisgall No Votes: none Abstain: none Absent: Commissioners Colwell, Flores, Lopez, Scott, and Soto
14.	• Community • Tribal • Legislative or Regulatory Changes	Establish standards for state and local permitting agencies to provide communities and Tribes with plain language written communications about geothermal power plant and DLE facility applications, the permitting processes to review the applications, and post-approval monitoring and enforcement. Information provided should also include education about the materials and processes used in DLE and lithium processing facilities, the final and intermediate products created, and any waste streams that must be managed.	Vote: Yes = 9, No = 0; Abstain = 0; Absent = 5 Yes Votes: Commissioners Castaneda, Dolega, Hanks, Kelley, Olmedo, Paz, Reynolds, Ruiz, and Weisgall No Votes: none Abstain: none Absent: Commissioners Colwell, Flores, Lopez, Scott, and Soto
15.	• Legislative or Regulatory Changes • Community • Tribal	Develop best practice guidance for CEQA lead agencies when initiating communications and consultation with Tribes (e.g., making multiple attempts through different methods, such as mail, email, telephone); providing reasonable time for Tribal governments to evaluate written materials; and recognizing the specific cultural, historical, public health, and ecological context of the Salton Sea region.	Vote: Yes = 9, No = 0; Abstain = 0; Absent = 5 Yes Votes: Commissioners Castaneda, Dolega, Hanks, Kelley, Olmedo, Paz, Reynolds, Ruiz, and Weisgall No Votes: none Abstain: none Absent: Commissioners Colwell, Flores, Lopez, Scott, and Soto

Table 2: Recommendations Considered but not Adopted by the Commission on November 17, 2022

Item	Topics	Recommendation	Action Taken
1.	• Potential Environmental Impacts • Safe Environmental Methods and Standards • Community • Tribal	Require and fund a study on whether increased geothermal development and DLE – and anticipated related development – would result in cumulative seismic and environmental impacts beyond those addressed in project level environmental review and the anticipated programmatic EIR established by Imperial County. The study should include recommendations to avoid, reduce, or minimize those impacts, and consider advance mitigation efforts.	Vote: Yes = 7, No = 1; Abstain = 1; Absent = 5 Yes Votes: Commissioners Castaneda, Dolega, Kelley, Olmedo, Paz, Reynolds, and Ruiz No Votes: Commissioner Hanks Abstain: Commissioner Weisgall Absent: Commissioners Colwell, Flores, Lopez, Scott, and Soto
2.	• Potential Economic Impacts • Community	Establish incentives for developers to enter into, and continue entering into, project labor agreements, establish workforce training and development strategies, implement High Road principles, and prioritize local hiring.	Vote: Yes = 6, No = 2; Abstain = 0, Absent = 6 Yes Votes: Commissioners Dolega, Kelley, Paz, Reynolds, Ruiz, and Weisgall No Votes: Commissioners Olmedo and Castaneda Abstain: none Absent: Commissioners Colwell, Flores, Hanks, Lopez, Scott, and Soto
3.	• Community • Safe Environmental Methods and Standards	The State should provide funds, from sources other than the Lithium Extraction Excise tax and funds allocated to Imperial County in the state's FY 22-23 Budget, for the formation of an advisory council to provide input and guidance to the State, Imperial County, and Lead Agencies on community and Tribal priorities. The advisory council members should include, but not be limited to, labor, community, environmental justice, and Tribal representation. Such guidance could include discussion of community benefit and labor agreements, actions to protect public health, safety, Tribal cultural concerns, and infrastructure improvements. The advisory council could also work to identify whether additional actions are needed to attract new, sustainable business development and economic activity.	Vote: Yes = 5, No = 3; Abstain = 0, Absent = 6 Yes Votes: Commissioners Castaneda, Olmedo, Dolega, Paz, and Ruiz No Votes: Commissioners Kelley, Reynolds, and Weisgall Abstain: none Absent: Commissioners Colwell, Flores, Hanks, Lopez, Scott, and Soto

Item	Topics	Recommendation	Action Taken
4.	• Overcoming Technical and Economic Challenges • Legislative or Regulatory Changes • Market Opportunities • Safe Environmental Methods and Standards • Community	Establish a centralized permit and regulatory reporting tracking system for California projects that extract lithium from geothermal brine and lithium-related projects, such as lithium battery component manufacturing and recycling. Identify and authorize the most appropriate state agency(ies) to establish and oversee a program requiring that entities recovering and producing lithium in California report the operations of their facilities across a set of metrics, such as water use, emissions, waste produced and managed, and make the information accessible to and understandable by members of the public.	The motion voted on was to remove this recommendation from consideration. Vote: Yes = 7, No = 2; Abstain = 0; Absent = 5 Yes Votes: Commissioners Castaneda, Dolega, Hanks, Kelley, Reynolds, Ruiz, and Weisgall No Votes: Commissioners Olmedo and Paz Abstain: none Absent: Commissioners Colwell, Flores, Lopez, Scott, and Soto Note: While this recommendation was not adopted, the Commissioners recognized the need to include a finding in the report that community and Tribal representatives advocated for the development of a centralized location for easily accessible information on DLE projects and related developments. This finding is in Chapter 4, Section H.
5.	• Potential Economic Impacts • Opportunities for Incentives/ Investments	As currently required pursuant to SB 125 (Committee on Budget and Fiscal Review, Chapter 63, Statutes of 2022), a study on the lithium excise tax is due December 31, 2023. To alleviate uncertainty for industry and the community, we recommend that the SB 125 tax mechanism study be completed by June 30, 2023.	The motion voted on was whether to remove this recommendation from consideration. Vote: Yes = 7, No = 0; Abstain = 1, Absent = 6 Yes Votes: Commissioners Castaneda, Kelley, Reynolds, Ruiz, Weisgall, Olmedo, and Paz No Votes: none Abstain: Commissioner Dolega Absent: Commissioners Colwell, Flores, Hanks, Lopez, Scott, and Soto

GLOSSARY OF TERMS

Term	Definition
Acre-foot	The volume of liquid that would cover one acre to a depth of one foot. One acre-foot equals about 326,000 gallons. For better understanding, one acre of land is roughly the size of a football field.
Assembly Bill 1657 (AB 1657)	Enacted in 2020, this bill added Section 25232 to the Public Resources Code, requiring the CEC to establish and convene the Blue Ribbon Commission on Lithium Extraction in California, and identifies topics related to lithium extraction for the Blue Ribbon Commission to review, investigate, and analyze. The bill requires the Blue Ribbon Commission to submit a report of their findings and recommendations to the Legislature.
Balancing Authority	The responsible entity that integrates energy resource plans ahead of time, maintains load-interchange generation balance within a balancing authority area, and supports interconnection frequency in real time.
Circular Economy	Circular economy, or cradle-to-cradle, transitions beyond today's take-make-waste linear pattern of production and consumption to a circular system in which the societal value of products, materials, and resources is maximized over time. The circular economy is based on three principles, driven by design: 1. Eliminate waste and pollution. 2. Circulate products and materials at their highest value. 3. Regenerate nature.[252]

252 "Circular Economy Introduction." Ellen Macarthur Foundation. Accessed November 28, 2022. https://ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview.

Term	Definition
Clean Transportation	Clean transportation describes the development of alternative fuels and advanced transportation technologies and the expansion of traditional public sector transportation services that results in lower emissions, greater efficiency of transportation per unit of energy, or a more accessible and usable transportation system.[253]
Coachella Valley	The Coachella Valley, is part of the Colorado Desert, extending northwestward for 45 miles from the Salton Sea through Riverside County to the San Gorgonio Pass between the Little San Bernardino Mountains to the east and the San Jacinto and Santa Rosa mountains to the west.[254]
Commercial Scale	Operating a facility or business at a production level sufficient to provide a material or product to market.
Direct lithium extraction (DLE) technologies	Direct lithium extraction (DLE) describes technologies that recover lithium from brine typically through the processes of adsorption, ion exchange, or solvent extraction, which are different from and unrelated to hard rock mining or use of evaporation ponds. The DLE from geothermal brine currently proposed for use in the Salton Sea Known Geothermal Resource Area will be colocated with new or existing geothermal power plants.
DLE facility	A facility using DLE technologies.

253 Clean Energy Solutions Center. Accessed on August 31, 2022. https://cleanenergysolutions.org/resources/clean-transport#:~:text=Clean%20transport%20describes%20the%20development,accessible%20and%20usable%20transportation%20system.

254 Britannica, The Editors of Encyclopaedia. March 16, 2018. "Coachella Valley". *Encyclopedia Britannica*. Accessed September 1, 2022. https://www.britannica.com/place/Coachella-Valley.

Term	Definition
Environmental justice	The fair treatment and meaningful involvement of people of all races, cultures, incomes, and national origins, with respect to development, adoption, implementation, and enforcement of environmental laws, regulations, and policies.[255]
Evaporation ponds	Large ponds used to evaporate water from lithium-rich salar brines in a common method of lithium extraction in some areas of the world. This process is water-intensive and can require thousands of square miles of land. DLE technologies currently proposed and being evaluate for use in Imperial County will not use evaporation ponds.
Geothermal brine	Geothermal brine is a naturally occurring concentrated underground saline solution that has circulated through very hot rocks and become enriched with elements.
Geothermal energy	Energy that is continually created from naturally occurring heat from within the earth. This energy is used for many purposes including generating electricity.
Geothermal power plant	Geothermal power plants generate electricity through the use of geothermal energy (heat from the Earth). Geothermal power plants extract steam or hot water – or brine – found below the earth's surface which is used to turn steam turbines and produce electrical power. The cooled condensed steam or brine is then injected back into the geothermal reservoir to be reheated and continue the renewable power generation cycle.
Geothermal reservoir or geothermal resource	Geothermal resources are reservoirs of hot water that exist at varying temperatures and depths below the Earth's surface. Wells can be drilled into these underground reservoirs to make use of steam and very hot water that can be brought to the surface for a variety of uses.[256]

255 State of California. Government Code Section 65040.12(e). https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?lawCode=GOV&sectionNum=65040.12

256 U.S. Department of Energy. "Geothermal Basics." Accessed November 29, 2022. https://www.energy.gov/eere/geothermal/geothermal-basics.

Term	Definition
Hard rock mining	Hard rock mining removes ore from the earth and is a common method of lithium extraction in some areas of the world. This process generally involves drilling and blasting into hard rock areas to mine the ore, which is then sorted, crushed, ground, separated, washed, filtered, and dried. DLE technologies currently proposed and being evaluated for use in Imperial County will not use hard rock mining.
Hydrothermal resource	An underground reservoir with water, heat, and permeability (the ability for liquids to gases to pass through it).
Imperial Irrigation District	The Imperial Irrigation District (IID) is a local publicly owned utility providing electricity and water services. IID's energy services provide power to all of Imperial County and portions of Riverside County and San Diego County. IID is also the nation's largest irrigation district, providing water for agricultural, municipal, commercial, and industrial uses primarily in Imperial County.
Imperial Valley	The Imperial Valley has commonly been identified to include the intensively irrigated part of the Colorado Desert, mainly in Imperial County extending southward from the southern end of the Salton Sea to Mexico.[257] The Imperial Valley includes portions of Imperial County and Riverside County.
Known Geothermal Resource Area	The "Geothermal Steam Act of 1970" defines a known geothermal resource area as "…an area in which the geology, nearby discoveries, competitive interests, or other indicia would, in the opinion of the Secretary [Secretary of the Interior], engender a belief in men who are experienced in the subject matter that the prospects for extraction of geothermal steam or associated geothermal resources are good enough to warrant expenditures of money for that purpose."[258]
Lithium carbonate	Lithium carbonate (Li_2CO_3) is a chemical compound used in manufacturing lithium-ion batteries as well as medicines and glassware, glazes for ceramics and other industrial uses.

257 Britannica, The Editors of Encyclopaedia. April 10, 2018. "Imperial Valley". Accessed 24 August 2022. *Encyclopedia Britannica*. https://www.britannica.com/place/Imperial-Valley.

258 "Geothermal Resources" 30 U.S.C. § 1001 (e). https://www.govinfo.gov/content/pkg/USCODE-2017-title30/html/USCODE-2017-title30-chap23.htm.

Term	Definition
Lithium carbonate equivalent	Lithium carbonate equivalent (LCE) is the industry standard term used for comparison of the lithium quantity in different lithium compounds. For example, to convert from lithium (Li) to LCE, multiply by 5.323.
Lithium chloride	Lithium chloride (LiCl) is a chemical compound. This is the form of lithium that typically results from the application of DLE methods to geothermal brine.
Lithium extraction	The removal of lithium from a naturally occurring state. In this report, lithium extraction refers to multiple approaches, including mining, evaporation ponds, and direct lithium extraction (DLE) from brine. In AB 1657 and when AB 1657 is referred to in this report, lithium extraction refers to DLE from geothermal brine.
Lithium recovery	The term lithium recovery is used in this report to describe the removal of lithium from a naturally occurring state using "DLE" technologies. Lithium recovery can also be used to describe any process to reclaim lithium from products or waste streams for reuse.
Lithium-ion battery	A lightweight, rechargeable battery often used in electric vehicles, as well as stationary energy storage. In the batteries, lithium ions move from the negative electrode (anode) to the positive electrode (cathode) during discharge and back when charging.
Lithium hydroxide	Lithium hydroxide (LiOH) is a lithium compound used in lithium-ion battery manufacturing.
Lithium processing or production	In this report, lithium processing or production refers to the additional actions taken to convert lithium chloride into battery-grade lithium compounds, such as lithium carbonate or lithium hydroxide monohydrate.
Lithium Valley	Lithium Valley is a term used by state leaders and others to describe a world-class lithium industry in California centered on recovery of lithium from geothermal brine in the Salton Sea KGRA and the expansion of geothermal energy production.

Term	Definition
Ore	Rock or other solid material containing a valuable mineral that can be mined.
Renewables Portfolio Standard	The Renewables Portfolio Standard, established by law in 2002, has been a primary driver for increasing clean energy generation in California and requires the state's electric utilities to ensure that their procurement of electricity products from eligible renewable energy resources achieves 44 percent of retail sales by December 31, 2024, 52 percent of retail sales by December 31, 2027, and 60 percent of retail sales by December 31, 2030.
Salt flat or salar	A salt-encrusted geological formation rich in salt and minerals, such as a dry lakebed. Some salars sit above shallow underground basins with salar brine that is rich in lithium.
Salar brine	Salar brine is found in shallow underground reservoirs beneath salt flats (also known as salars). Some salar brine is rich in lithium. Evaporation ponds are commonly used to separate lithium from salar brines.
Salton Sea Known Geothermal Resource Area	The Salton Sea Known Geothermal Resource Area (Salton Sea KGRA) refers to a geothermal resource on the southeastern side of the Salton Sea near Calipatria (Imperial County). There are 11 geothermal power plants that currently use this resource for energy production.
Salton Sea Region	As defined by the Commission, the Salton Sea Region, includes Eastern Coachella and Imperial Valleys. It includes all of Imperial County and Eastern Coachella Valley in Riverside County, extending from the city of Coachella and unincorporated communities near the Salton Sea, and then farther east to the California-Arizona border. This large area is notably economically distinct with approximately 150,000 people living and working in its communities. Major employment sectors across the area include agriculture and tourism, making these communities more similar to each other than they are to the economies of the Inland Empire and San Diego.[259]

259 Blue Ribbon Commission. 2022. Modified by Commissioner discussion, from the definition provided in "Final Letter Regarding Community Economic Resilience Fund (CERF) Recommendations for Salton Sea Region." https://efiling.energy.ca.gov/GetDocument.aspx?tn=242292&DocumentContentId=75794.

Term	Definition
The 100 Percent Clean Energy Act of 2018 or Senate Bill 100 (SB 100)	The 100 Percent Clean Energy Act of 2018 was created by Senate Bill 100 (SB 100) (De León, Chapter 312, Statutes of 2018). SB 100 set new clean energy goals for the state, including that by December 31, 2045, eligible renewable energy resources and zero-carbon resources will supply 100 percent of all retail sales of electricity to California end-use customers and 100 percent of electricity procured to serve all California state agencies.

Appendices

The full report and appendices are available online in the Blue Ribbon Commission docket, 20-LITHIUM-01 (https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=20-LITHIUM-01), which is administered by the CEC. A list of the appendices is provided below.

- Appendix A: List of Blue Ribbon Commission Meetings and Workshops
- Appendix B: Acknowledgement of Guest Speakers
- Appendix C: Summary of Public Comments on Draft Report

Appendix A: List of Blue Ribbon Commission Meetings and Workshops

The Blue Ribbon Commission held the following public meetings to inform development of this report.[260] As noted below, many of the public meetings included a public workshop:

1. 2021, February 25. Kickoff of Blue Ribbon Commission
2. 2021, March 25. Guest presentation on global lithium market and panel discussion by industry and academia on active lithium recovery facilities.
3. 2021, April 29. Panel on global lithium perspective
4. 2021, May 27. Administrative meeting (discussion of report topics)
5. 2021, June 24. Administrative meeting (discussion of report topics)
6. 2021, July 29. Lithium extraction methods workshop
7. 2021, August 26. Developing geothermal and lithium co-production workshop
8. 2021, September 30. Lithium market opportunities workshop
9. 2021, October 28. Environmental impacts workshop
10. 2021, November 17. Community forum
11. 2021, December 16. Administrative meeting (follow-up to community forum)
12. 2022, January 27. Administrative meeting (potential recommendations for report)
13. 2022, February 16. Administrative meeting (proposed fiscal year 2022–2023 state budget and CERF letter)
14. 2022, February 24. Workforce development workshop
15. 2022, March 24. Continuation of environmental impacts workshop
16. 2022, May 12. Economic impacts workshop
17. 2022, May 26. Workshop on incentives and investments to facilitate lithium extraction from geothermal brines and development of lithium-dependent products and businesses
18. 2022, June 16. Workshop on the role of existing and new geothermal facilities in Imperial Valley to support reliability, grid stability, resiliency, and clean energy goals. Also, workshop on overcoming challenges to extraction, processing, and production of lithium from geothermal brine.
19. 2022, June 30. Continuation of environmental impacts workshop
20. 2022, July 21. Tribal session and community session

260 A transcript for each Blue Ribbon Commission meeting is posted to the docket for the Lithium Valley Commission: 20-LITHIUM-01. https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=20-LITHIUM-01.

21. 2022, August 25. Administrative meeting (update on the enacted fiscal year 2022–2023 California state budget, status of CEC rulemakings related to permitting, and report schedule/process)
22. 2022, September 29. Draft Report to the Legislature
23. 2022, October 18. Community and Tribal Workshop on the Draft Report (Niland)
24. 2022, October 19. Community and Tribal Workshop on the Draft Report (North Shore)
25. 2022, October 20. Community and Tribal Workshop on the Draft Report (Salton City)
26. 2022, October 24. Community and Tribal Workshop on the Draft Report (Teleconference)
27. 2022, October 31. Discussion of Draft Report to the Legislature and direction to CEC staff on revisions
28. 2022, November 17. Discussion and action on the Revised Draft Report to the Legislature and direction to CEC staff on revisions

Appendix B: Acknowledgement of Guest Speakers

The Blue Ribbon Commission acknowledges the contributions of guest speakers to share their expertise and experience at public meetings and workshops from February 2021 through July 2022 to inform development of this report. Their input is deeply appreciated.

The following list includes guest speakers from one or more meetings or workshops through June 2022. Guest speakers for the Tribal session and the community session held during the July 21, 2022, Blue Ribbon Commission meeting are listed separately.

Daniel Adler, California Infrastructure and Economic Development Bank

Rafael Aguilera, California Workforce Development Board

Mary U. Akens, Attorney IV, Department of Water Resources

Rizaldo Aldas, California Energy Commission

Jamie Asbury, Imperial Irrigation District

Lisa Belenky, Center of Biological Diversity

Chris Benner, Ph.D., UC Santa Cruz

Derek Benson, EnergySource

Trelynd Bradley, Governor's Office of Business and Economic Development

Erica Brand, California Energy Commission

Jose T. Bravo, Just Transition Alliance

Marc Cowan, California Workforce Development Board

Kyle J. Dahl, US Army Corps of Engineers

Elisabeth DeJong, Renewable Energy Division, CEC

President Adela de La Torre, San Diego State University

Kim Delfino, Earth Advocacy

Roderic Dolega, Ford EV Purchasing

Karen Douglas, California Energy Commission

Melinda Dorin, Department of Water Resources

Deborah Dyer, California Energy Commission

Dr. Paul English, Public Health Institute

Cecilia Estolano, Better World Group

Jared Ferguson, California Public Utilities Commission

Daniela Flores, Imperial Valley Equity and Justice Coalition

Sarah Friedman, Better World Group

Noemí Gallardo, California Energy Commission

John Gay, County of Imperial

Logan Goldie-Scot, BloombergNEF - Head of clean power research

Alex Grant, Jade Cove Partners - Principal

Susanne Heim, Panorama Environmental, Inc.

John Hernandez, Our Roots Multicultural Center

Sahara Huazano, Alianza Coachella Valley

Shrayas Jatkar, California Workforce Development Board

Danny Kennedy, New Energy Nexus and CalCharge

Eric Knight, California Energy Commission

Professor Fernando Leiva, UC Santa Cruz

Marco Lizarraga, La Cooperativa Campesina

Dr. Jonathan London, University of California, Davis Department of Human Ecology and the Community and Regional Department of Environmental Health Science Center

Priscilla Lopez, Imperial County Workforce and Economic Development Office

Danny Machain, International Brotherhood of Electrical Workers (IBEW) Local 569

Lina Malova, Assemblymember Edwardo Garcia's Office

Tonya Marshall, Department of Fish and Wildlife

Henry Martinez, Imperial Irrigation District

Michael McKibben, University of California, Riverside

Jim McKinney, Fuels and Transportation Division, CEC

Robert Meyer, Employment Training Panel

Hector Meza, IBEW 569

Jim Minnick, Imperial County Planning and Department Services

Anthony Ng, Energy Research and Development Division, CEC

Angelita Ortiz, Calipatria Unified School District Interim Superintendent

Dr. Rebecca Paisley, Cornish Lithium - Exploration Geochemist

Adam Panayi, Rho Motion

Cameron Perks, Senior Analyst, Benchmark Minerals Intelligence

Thea N. Riofrancos, Providence College

Abby Rodriguez, Sparkz

Burt Short, BHE Renewables

Tina Shields, Imperial Irrigation District

Efrain Silva, Imperial County College

Jordan Sisson, Comite Civico del Valle

Karen Skelton, U.S. Department of Energy

Meg Slattery, University of California, Davis and Lawrence Berkeley National Lab

Eric Smith, Berkshire Hathaway Energy

Peter Streit, California Organized Investment Network

Rebecca Terrazas-Baxter, Imperial County

William Thomas, BHE Renewables

Jon Trujillo, BHE Renewables

Jim Turner, CTR

Charlene Wardlow, CalGEM

Ian Warren, National Renewable Energy Laboratory

Renee Webster-Hawkins, California Energy Commission

Jonathan Weisgall, Berkshire Hathaway Energy

Michael Whittaker, Lawrence Berkeley National Laboratory

Dr. Carol Zabin, University of California, Berkeley

Guest Speakers From the Tribal Perspectives Session of the July 21, 2022, Blue Ribbon Commission Meeting

In addition, the Blue Ribbon Commission would like to thank the California Native American Tribes that organized the Tribal session held during the July 21, 2022, Blue Ribbon Commission meeting. A transcript of this session is available online.[261, 262] The following speakers participated in the session:

Jordan Joaquin, President of Quechan (Kwatsáan) Tribe of the Fort Yuma Indian Reservation

Thomas Tortez Jr., Chair of the Torres Martinez Desert Cahuilla Indians

Jesus Arguelles, Torres Martinez Desert Cahuilla Indians

Preston Arrow-weed, Quechan (Kwatsáan) Tribe of the Fort Yuma Indian Reservation

Lorey Cachora, Quechan (Kwatsáan) Tribe of the Fort Yuma Indian Reservation

261 Blue Ribbon Commission. 2022. "Transcript of July 21, 2022, Blue Ribbon Commission Meeting." https://efiling.energy.ca.gov/GetDocument.aspx?tn=245784&DocumentContentId=79989.

262 A transcript for each Blue Ribbon Commission meeting is posted to the docket for the Blue Ribbon Commission, 20-LITHIUM-01. https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=20-LITHIUM-01.

Courtney Ann Coyle, Counsel for Carmen Lucas

Alan Hatcher, Quechan (Kwatsáan) Tribe of the Fort Yuma Indian Reservation

Carmen Lucas, Kwaaymii, Laguna Band of Indians

Gloria McGee, Quechan (Kwatsáan) Tribe of the Fort Yuma Indian Reservation

Faron Owl, Quechan (Kwatsáan) Tribe of the Fort Yuma Indian Reservation

Bobby Wallace, Barona Band of Mission Indians

Guest Speakers from the Community Perspectives Session of the July 21, 2022, Blue Ribbon Commission Meeting

Also, The Blue Ribbon Commission would like to thank guest speakers for their participation in the Community Perspectives Session on July 21, 2022. A transcript of this session is available online.[263, 264] The following speakers participated in the session:

Cecilia Armenta

Simon Canales (Brawley Union High School District)

Richard Cordero (Westmorland)

Angel De Dios

Carlos Gonzalez (Imperial County)

Elizabeth Jaime (North Shore)

Adriana Torres

Monique Ureña

263 Blue Ribbon Commission. 2022. "Transcript of July 21, 2022, Blue Ribbon Commission Meeting." https://efiling.energy.ca.gov/GetDocument.aspx?tn=245784&DocumentContentId=79989.

264 A transcript for each Blue Ribbon Commission meeting is posted to the docket for the Blue Ribbon Commission, 20-LITHIUM-01. https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=20-LITHIUM-01.

Appendix C: Summary of Public Comments on the Draft Report

The Commission received over 290 comments on the initial draft report. A diverse group of stakeholders submitted comments, including residents and general public, industry, community-based organizations, Tribes and Tribal members, labor unions and trade councils, and other governmental entities. A summary of comments is available online in the docket.[265]

Key themes and topics raised in docketed public comments on the draft report include the following:

- Support for the recovery of lithium and related development to provide local economic benefits and jobs to the local community (nearly 260 docketed comments, a majority from a template, focused on this topic).
- Strengthen Tribal consultation, fund technical assistance to Tribes, include Tribes in business opportunities, and ensure protection of Tribal environmental and cultural resources.
- Create a framework for the region to recover and process lithium in a safe and expeditious fashion.
- Support project labor agreements, state-certified apprenticeships, and high road job and career approaches with family-supporting wage and benefit standards, worker protections, including right to organize, and employer commitments to invest in worker training.
- Provide accessible additional information on potential environmental and public health impacts and the mitigation measures imposed on specific projects.

Key themes and topics on the draft report raised in the four community and Tribal workshops held in October 2022 were similar to written comments received in the docket, and included:

- Concern of the unknown and excitement about the potential opportunity.
- Request for more information made available in accessible formats specific to lithium recovery projects, economic benefits, environmental and public health impacts.
- Potential cumulative public health and environmental impacts need to be identified, communicated, and mitigated.
- Fenceline communities near DLE projects should be prioritized in both investment, and mitigation of potential environmental impacts.
- Investment and public health and mitigation is necessary across the broader region.
- Request to define Lithium Valley with a physical boundary to ensure that communities close to the DLE projects directly benefit (jobs, schools, infrastructure).

265 Blue Ribbon Commission. November 17, 2022. "Summary of Written Comments on the Initial Draft Report and Staff's Draft Responses."
https://efiling.energy.ca.gov/GetDocument.aspx?tn=247504&DocumentContentId=81904.

3

IV Healthcare District Board Eyes Hospital Financials

CHRONICLING OUR COMMUNITY, BORDER REGION, AND BEYOND SINCE 1904

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Top Stories

Covering stories that matter to the community.

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LEGAL NOTICES: Feb. 8, 2024
LEGAL NOTICES: Feb. 1, 2024

U.S. Rep. Raul Ruiz, D-Palm Desert (right, at podium) said he was thankful to state Gov. Gavin Newsom (left) for keeping his campaign pledge to address long standing environmental and socioeconomic issues in the Imperial Valley during Newsom's tour of the Controlled Thermal Resources Hell's Kitchen lithium extraction project near Niland in March 2023. | JULIO MORALES FILE PHOTO

IN REGIONAL NEWS

Hell's Kitchen Lithium Extraction Project Gets Green Light

Controlled Thermal Resources' Geothermal Plant to Produce Up to 49.9 Megawatts and Up to 20,000 Metric Tons of Lithium

DELFINO MATUS AND RICHARD MONTENEGRO BROWN ON DECEMBER 15, 2023 LAST UPDATED: DECEMBER 17, 2023

Last updated: December 17, 2023

EL CENTRO — Controlled Thermal Resources' Hell's Kitchen project west of Niland would reportedly produce enough lithium to develop 5 million electric vehicle batteries a year — enough EV batteries to eliminate 1.95 billion gallons of gasoline used and 23 metric tons of emissions annually, CTR's Rod Colwell said earlier this year.

The loquacious Aussie and the company's chief executive officer said this in March as Gov. Gavin Newsom used CTR's small-scale operation as the backdrop of a press conference touting Imperial County's status as the source of the nation's coming supplier of the critical mineral in Lithium Valley.

On Wednesday, Dec. 13, CTR took a huge leap in moving its projects forward when the company received ›vals from the Imperial County Planning Commission on eight resolutions tied to the development of He''' ←en's geothermal plant and lithium extraction facility. →

The commission conducted a public hearing on the resolutions regarding Controlled Thermal Resources Inc. via its subsidiary, Hell's Kitchen Geothermal LLC's proposed Hell's Kitchen Power Company 1 (geothermal) and Hell's Kitchen Lithium Company 1 (direct lithium extraction) projects. The resolutions were for water supply assessment, the final environmental impact report, the mitigation monitoring and reporting program, conditional-use permits and consideration of variance.

The geothermal plant proposes to produce up to 49.9 megawatts of "thermal green energy." The project includes cooling towers up to 40 feet and 230-kilovolt "gen-tie" structures up to 120 feet, according to CTR. Gen-tie transmission lines are those that connect the original source of power generation to the transmission system.

'olled Thermal Resources Hell's Kitchen lithium project near Niland was in the process of being fully developed in this M 2023 photo. | JULIO MORALES FILE PHOTO

The lithium operation proposal was to develop mineral extraction and processing facilities capable of producing lithium hydroxide, silica, bulk sulfide and polymetallic products for commercial sale. A mitigation monitoring and reporting program for mitigation measures has been incorporated into the project to reduce or avoid significant effects on the environment, according to CTR's proposal. This program will be designed to ensure that these measures are carried out during project construction and operation, CTR states. The project features include cooling towers up to 50 feet, silos up to 60 feet, evaporator structures up to 80 feet and crystallizers up to 110 feet.

The project's plants and facilities will be located on undeveloped land owned by the Imperial Irrigation District, which is about 3.6 miles southwest of Niland on 16 parcels. The project's plant facilities would be built on about 65 acres, including a gen-tie line.

The projects would produce approximately 20,000 metric tons of lithium and would demand an estimated 6,500 acre-feet of water, according to CTR's proposal. Both of these projects would have shared facilities.

Not all that much was said about the lithium extraction process, and maybe the Planning Commission meeting wasn't the place. But in the past, CTR CEO Colwell has described the Hell's Kitchen extraction process as a closed-loop system that doesn't release any carbon dioxide into the atmosphere.

Jared Naimark, California organizer with Earthworks, an environmental justice organization dedicated to preventing the destructive impacts of the extraction of oil, gas and minerals, speaks out against approving resolutions for Controlled Thermal Resources' geothermal and lithium extraction facilities west of Niland during an Imperial County Planning Commission meeting on Wednesday, Dec. 13. | DELFINO MATUS PHOTO

"After two years of research last month, we published a report together with Comite Civico del Valle, examining the potential environmental impacts of lithium extraction here in the Imperial Valley. I am not against Lithium Valley; I think Imperial has an opportunity to do this the right way, but unfortunately the environmental impact report for Controlled Thermal Resources' Hell's Kitchen Project is very clearly not the right way. I am here to comment in solidarity with concerned residents here in the Valley," said Jared Naimark, California organizer with Earthworks, an environmental justice organization dedicated to preventing the destructive impacts of the extraction of oil, gas and minerals.

"We have reviewed the final EIR and are concerned that it remains inadequate to properly disclose, analyze and mitigate the significant environmental impacts that the project required. I ask that the commission not certify," Naimark said.

"There is a lot of concern on the use of water. We are especially concerned with the use of water as our neighbor geothermal outfits are. We try to use water as sparingly as we can. We actually have a mandate within our company of looking at our use of water, looking at how many times we can reuse a gallon of water. How little water we can use in this process knowing that water is a precious commodity especially here in the Imperial Valley," said Jim Turner, president of Controlled Thermal Resources.

"It is very unusual that there are no project alternatives at all, and I find that lacking. The project still fails to consider several other projects that are in the area for cumulative impacts. Energy projects, geothermal, solar as well as restoration projects," Dr. James Blair said.

Jim Turner, president of Controlled Thermal Resources, speaks in favor of approving resolutions for Controlled Thermal Resources' geothermal and lithium extraction facilities west of Niland during an Imperial County Planning Commission meeting on Wednesday, Dec. 13. | DELFINO MATUS PHOTO

SEE ALSO

The next phase in the development wasn't yet known following Wednesday's meeting. In March, however, CT Colwell revealed that on the labor front the Hell's Kitchen project is expected to produce more than 10,000 jobs

over the course of its development and use project labor agreements between contractors and trade unions.

Controlled Thermal Resources is said to have entered a $1.4 billion deal with Fuji Electric Corp. of America to complete the construction of the Hell’s Kitchen plant and potentially build five more at the site near Niland, it was reported earlier this year.

Colwell was one of several speakers who addressed the gathered crowd during Gov. Newsom’s visit in March.

(CORRECTION: The incorrect amount of water use projected for the Hell’s Kitchen projects was initially published due to a reporting error. We strive to be as accurate as possible and regret all mistakes.)

TAGS #CONTROLLED THERMAL RESOURCES #HELL'S KITCHEN #IMPERIAL COUNTY NEWS #IMPERIAL COUNTY PLANNING COMMISSION #LITHIUM EXTRACTION

Richard Montenegro Brown

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CLIMATE

Ghost towns and toxic fumes: How an idyllic California lake became a disaster

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KEY POINTS

The Salton Sea's increasing salinity is killing off wildlife and its receding shoreline is exposing communities in the Riverside and Imperial counties to toxic fumes.

The lake has been shrinking for decades. But the problem has grown severe in the past few years.

Once a hot tourist destination, experts say the Salton Sea has become the worst environmental and public health crisis in modern history.

Emma Newburger | CNBC

IMPERIAL COUNTY, CALIF. — The vision for Salton City was clear: A bustling, resort community along the crystal blue waters of the Salton Sea. Residents could enjoy their own boat docks and stroll down palm tree-lined streets to the beach.

The city's reality is more grim. Instead of a vacation spot, it feels like a post-apocalyptic ghost town. Most of the homes were demolished or never built. The palm trees are stumps. And the sea, while beautiful, is toxic.

"People here used to fish, swim, bring their boats," said Frank Ruiz, Audubon's Salton Sea Program Director, as he stood by a crumbling dock on land that once held water. "They went from living in paradise to living in hell."

Here in the southeastern corner of California, flanked by sprawling mountains and desert, lies the state's largest and most troubled body of water, along with the mostly abandoned communities near its shore.

The shrinking of the Salton Sea could be a preview of what will happen in other communities across the U.S. West as water supplies become less predictable with climate change. Years of drought have severely depleted reservoirs that feed the Colorado River and looming water cuts could affect millions of people.

Salton City, located on the coast of the Salton Sea, was once planned and developed as a resort community. The area is now a ghost town with mostly empty lots and demolished homes.

Emma Newburger | CNBC

The landlocked lake was created in 1905 when an accidental inflow of water from the Colorado River filled a low-lying depression in the desert called the Salton Sink. The lake grew to 400 square miles in just a couple years and remained full because of drainage water from farms mostly in the Imperial Valley.

Tourism and wildlife flourished at the sea in the mid 1900s. During the 20th century, California lost about 95% of its wetlands and inland lakes, which made Salton a critical habitat for millions of migratory birds.

In the 1970s, the lake began to experience rising salinity levels and contamination from agricultural runoff. Now, the lake's ecosystem is collapsing, and scientists forecast the water could become so salty that only bacteria will be able to survive. In 1999, the sea covered 375 square miles but has since shrunk by more than 45 square miles.

Many of the more than 400 bird species reliant on the sea are dying, and all but one fish species has died off in the sea's main body of water, according to the National Audubon Society. Former lakebed is turning into exposed playa, which has created a public health hazard for more than

The North Shore Beach and Yacht Club sits along the along the northeastern shore of the Salton Sea. It was closed in the 1980s after its jetty was destroyed by fluctuating water levels.
Emma Newburger | CNBC

The lakeside homes in Salton City, the populated tourist beach of Bombay, and the yacht club that once hosted prominent figures like Frank Sinatra and the Beach Boys are now mostly deserted and badly polluted.

"Fifty years ago, you'll find restaurants, night clubs and golf clubs here," Ruiz said of the abandoned yacht club on the northeastern shore of the sea. The club was closed in the 1980s after its jetty was destroyed by fluctuating water levels. It's since been converted to a museum about the lake's history.

"Now look at what we have," Ruiz continued. "The worst environmental, health and economic crisis in modern history."

Toxic fumes harm poor communities

The Salton Sea has been shrinking for decades, but the problem has grown severe in the past few years.

The major cause of the sea's water loss stems from California's effort to use less water from the

Lake Mead and Lake Powell, the major reservoirs on the river, are experiencing a record decline in water levels while water demand from surrounding cities and suburbs remains high. The federal government will begin rationing water from Lake Mead for the first time next January.

In order to reduce its reliance on the river, California in 2003 struck a deal with the Imperial Irrigation District, which supplies Imperial Valley farmland with Colorado River water, to transfer as much as 200,000 acre-feet of water to coastal San Diego for up to 75 years.

Remains of a burned boat on Bombay beach. Bombay was once a popular tourist destination, but the increasing salinity, shrinking and fumes of Salton Sea rendered it a ghost town full of bohemian-style art.

Emma Newburger | CNBC

The deal, called the Quantification Settlement Agreement, was the largest agricultural-to-urban water transfer in U.S. history. To mitigate damage to the Salton Sea, the deal mandated that the Imperial Irrigation District send additional water to Salton through 2017.

Imperial Valley farmers continued to farm many of the country's winter vegetables successfully while consuming less water. Even after the water transfer, the Imperial Valley uses more than half of California's entire water draw from the Colorado River, according to data from the U.S.

Imperial Valley to the Salton Sea accelerated, and the Imperial County Board of Supervisors declared a local state of emergency over air pollution at the sea.

Progress has been slow and the cost of inaction is significant. A combination of worsening air quality, a loss of ecological habitat, declining recreational revenue and property devaluation could cost up to $70 billion over three decades, according to a report published in 2014.

Imperial County, one of the poorest counties in California with predominantly Latino residents, has been especially affected by a rotten-egg odor from hydrogen sulfide overrunning the sea's oxygen-deprived water. It's also exposed to the dust billowing from dry lakebed, which contains toxins like arsenic and selenium.

Artwork on Bombay beach. The mostly abandoned area holds an annual art festival called the Bombay Beach Biennale.
Emma Newburger | CNBC

Imperial is now known for some of the worst air quality in the country. It has the highest rate of asthma-related emergency room visits for children in California — about double the state average, according to research in the International Journal of Environmental Research and Public Health.

policy delay and inaction is linked to the fact that populations living closest to the sea are predominantly low-income, communities of color.

"If the sea was next to Los Angeles, it would have been fixed long ago," Ruiz said. "But it's next to poor communities — and they don't have the political leverage."

"I think things will change when the sea starts affecting wealthier communities in Palm Springs," Ruiz added. "When the gated communities start feeling the effects of poor air quality, more action will be taken."

Robert Schettler, a spokesperson for the Imperial Irrigation District, said the district is working on some projects at the sea, like smaller air quality mitigation plans and vegetation establishment, but said the solutions are the state's responsibility.

"It's a huge problem that needs immediate attention," Schettler said. "IID understands the interest in seeing the issues at the Salton Sea get the attention they deserve, and while action may be slow in coming, we are pleased to see that more has been happening."

California is far from a fix

County officials for years have urged California to move forward delayed plans to build wetlands along the lake's exposed shoreline.

In 2018, California instituted the Salton Sea Management Program to manage the crisis. The state's Natural Resources Agency unveiled a 10-year plan to construct 30,000 acres of habitat and dust suppression projects and is evaluating importing water.

One possibility is bringing in water from the Sea of Cortés, desalinating it and pumping it into the lake, though it would be expensive. Another idea is to lease water from agricultural users in the Imperial Valley.

The Species Conservation Habitat Project, part of California's 10-year plan to address issues at Salton Sea, encompasses about 3,770 acres of exposed lake bed. The area is home to wildlife such as egrets and shorebirds.
Emma Newburger | CNBC

California has committed over $270 million in funding to implement habitat, dust suppression and water quality improvement projects at the sea. The state also committed another $220 million for the sea earlier this year as part of Gov. Gavin Newsom's water infrastructure and drought response proposal.

It's also building a $206 million Species Conservation Habitat Project, the first large-scale habitat project for the sea. The project, which is home to wildlife like egrets and shorebirds, is set to be completed in 2023.

But the state's work on the Salton Sea has been slower than promised.

By the end of 2020, the state had constructed a total of 755 acres of dust suppression projects — its original goal was 1,750 acres — and had not completed any habitat projects, according to the Salton Sea Management Program's 2021 report.

Geothermal mud pots located near the shore of the Salton Sea. Mining for lithium, a component of rechargeable batteries, is seen as an economic and environmental opportunity for the community.
Emma Newburger | CNBC

Michael Cohen, a senior researcher at the Pacific Institute, has studied water use in the Colorado River basin and the management of the Salton Sea for more than two decades. Cohen said the crisis has "absolutely not" been adequately addressed and prioritized by the state.

"The state is well behind schedule on the restoration of Salton Sea," Cohen said. "There's a lot of money available and a lot of water. But they haven't staffed up quickly enough. And there's a lot of bureaucracy, which takes a long time."

"The challenges of the Salton Sea are complex and urgent, and further degradation of the sea will compound existing problems," Arturo Delgado, assistant secretary for Salton Sea Policy at the Natural Resources Agency, said in a statement.

"We recognize that progress has been slow in the past, but the state and its partners have demonstrated a solid commitment to deliver projects on the ground," Delgado said. "While the past has seen many delays, we have built strong momentum in recent years and have added key staff to expand our capacity."

Salton Sea beach is located along the western shore of the Salton Sea. The sea is not safe for swimming, boating or fishing.
Emma Newburger | CNBC

One major economic prospect is lithium extraction. As the sea's shoreline recedes, it exposes playa that can provide access to lithium, a component of electric vehicles and energy storage.

The state's energy commission has provided funding to energy companies to explore for lithium, with the vision that geothermal development and lithium recovery could provide clean energy and spur local job growth.

The Salton Sea can never be restored to what it once was, since California doesn't have enough water to fill it again and climate change continues to worsen drought conditions.

But while progress towards addressing the crisis has been stalled, experts urge that it's not too late for California to find and implement fixes.

"We have a moral obligation to look after the wildlife and communities affected by the Salton Sea," Ruiz said. "I'd love to see this lake full of water, but it's not feasible. The solution is for communities, water districts and environmental groups to find common ground and protect it."

Earthjustice

Batch 5 of Attachments to Scoping Comments on Proposed Lithium Valley Specific Plan and Program Environmental Impact Report

Feb. 20, 2024

Notice of Completion & Environmental Document Transmittal

Mail to: State Clearinghouse, P.O. Box 3044, Sacramento, CA 95812-3044 (916) 445-0613
For Hand Delivery/Street Address: 1400 Tenth Street, Sacramento, CA 95814

SCH #

Project Title: Lithium Valley Specific Plan

Lead Agency: Imperial County | Contact Person: Diana Robinson/Jim Minnick
Mailing Address: 801 Main Street | Phone: 442-265-1726
City: El Centro | Zip: 92243 | County: Imperial

Project Location: County: Imperial | City/Nearest Community: Calipatria/ Niland/ Brawley
Cross Streets: NA | Zip Code: NA
Longitude/Latitude (degrees, minutes and seconds): ____° ____′ ____″ N / ____° ____′ ____″ W Total Acres: ____
Assessor's Parcel No.: ____ Section: ____ Twp.: ____ Range: ____ Base: ____
Within 2 Miles: State Hwy #: 111 | Waterways: Salton Sea, Alamo River, New River
Airports: Calipatria Municipal | Railways: Calexico Subdivision UPRR | Schools: Calipatria High, Fremont Primary

Document Type:

CEQA: ☒ NOP ☐ Draft EIR | NEPA: ☐ NOI | Other: ☐ Joint Document
☐ Early Cons ☐ Supplement/Subsequent EIR | ☐ EA | ☐ Final Document
☐ Neg Dec (Prior SCH No.) ____ | ☐ Draft EIS | ☐ Other: ____
☐ Mit Neg Dec Other: ____ | ☐ FONSI

Local Action Type:

☐ General Plan Update ☒ Specific Plan ☐ Rezone ☐ Annexation
☐ General Plan Amendment ☐ Master Plan ☐ Prezone ☐ Redevelopment
☐ General Plan Element ☐ Planned Unit Development ☐ Use Permit ☐ Coastal Permit
☐ Community Plan ☐ Site Plan ☐ Land Division (Subdivision, etc.) ☐ Other: ____

Development Type:

☐ Residential: Units ____ Acres ____
☐ Office: Sq.ft. ____ Acres ____ Employees ____
☐ Commercial: Sq.ft. ____ Acres ____ Employees ____
☐ Industrial: Sq.ft. ____ Acres ____ Employees ____
☐ Educational: ____
☐ Recreational: ____
☐ Water Facilities: Type ____ MGD ____
☐ Transportation: Type ____
☐ Mining: Mineral ____
☐ Power: Type ____ MW ____
☐ Waste Treatment: Type ____ MGD ____
☐ Hazardous Waste: Type ____
☒ Other: Specific Plan

Project Issues Discussed in Document:

☒ Aesthetic/Visual ☐ Fiscal ☒ Recreation/Parks ☒ Vegetation
☒ Agricultural Land ☒ Flood Plain/Flooding ☒ Schools/Universities ☒ Water Quality
☒ Air Quality ☒ Forest Land/Fire Hazard ☒ Septic Systems ☒ Water Supply/Groundwater
☒ Archeological/Historical ☒ Geologic/Seismic ☒ Sewer Capacity ☒ Wetland/Riparian
☒ Biological Resources ☒ Minerals ☒ Soil Erosion/Compaction/Grading ☒ Growth Inducement
☐ Coastal Zone ☒ Noise ☒ Solid Waste ☒ Land Use
☒ Drainage/Absorption ☒ Population/Housing Balance ☒ Toxic/Hazardous ☒ Cumulative Effects
☐ Economic/Jobs ☒ Public Services/Facilities ☒ Traffic/Circulation ☐ Other: ____

Present Land Use/Zoning/General Plan Designation:

Recreational/Open Space; Agriculture; Government/Special Public; Residential

Project Description: *(please use a separate page if necessary)*

The Project aims to develop a Specific Plan (SP) to facilitate the existing and future renewable energy development, lithium extraction, and associated infrastructure, commercial, and industrial uses within the SP Area (SPA). The agricultural properties in the SPA have historically been utilized for crop cultivation and are equipped with irrigation ditches for water supply. The Salton Sea, as the primary water feature in the County, is a closed basin with a drainage area of 8,000 square miles. Any construction near the Salton Sea below the 220-foot contour necessitates a permit. The Project aligns with federal and state objectives for renewable energy sources and the procurement of raw materials for battery-powered vehicles. The development of the SP will provide a framework and guidance for the necessary infrastructure and facilities to achieve these objectives.
By leveraging the unique environmental characteristics of the Imperial Valley, this Project aims to harness renewable energy resources, extract lithium and potentially other available minerals , develop manufacturing and distribution of related products (electric batteries, capacitors, vehicles, components etc..), other innovative renewable resources industries, and develop the associated infrastructure in a sustainable and environmentally conscious manner. Through careful planning and adherence to regulatory requirements, the Project seeks to foster economic growth, support clean energy initiatives, and preserve the region's natural resources and biodiversity.

Note: The State Clearinghouse will assign identification numbers for all new projects. If a SCH number already exists for a project (e.g. Notice of Preparation or previous draft document) please fill in.

Reviewing Agencies Checklist

Lead Agencies may recommend State Clearinghouse distribution by marking agencies below with and "**X**".
If you have already sent your document to the agency please denote that with an "**S**".

X	Air Resources Board	____	Office of Historic Preservation
____	Boating & Waterways, Department of	____	Office of Public School Construction
____	California Emergency Management Agency	____	Parks & Recreation, Department of
____	California Highway Patrol	____	Pesticide Regulation, Department of
____	Caltrans District # ____	X	Public Utilities Commission
____	Caltrans Division of Aeronautics	X	Regional WQCB # ____
X	Caltrans Planning	X	Resources Agency
____	Central Valley Flood Protection Board	____	Resources Recycling and Recovery, Department of
____	Coachella Valley Mtns. Conservancy	____	S.F. Bay Conservation & Development Comm.
____	Coastal Commission	____	San Gabriel & Lower L.A. Rivers & Mtns. Conservancy
____	Colorado River Board	____	San Joaquin River Conservancy
____	Conservation, Department of	____	Santa Monica Mtns. Conservancy
____	Corrections, Department of	X	State Lands Commission
____	Delta Protection Commission	____	SWRCB: Clean Water Grants
____	Education, Department of	____	SWRCB: Water Quality
X	Energy Commission	____	SWRCB: Water Rights
____	Fish & Game Region # ____	____	Tahoe Regional Planning Agency
____	Food & Agriculture, Department of	____	Toxic Substances Control, Department of
____	Forestry and Fire Protection, Department of	____	Water Resources, Department of
____	General Services, Department of		
____	Health Services, Department of	____	Other: ____
____	Housing & Community Development	____	Other: ____
X	Native American Heritage Commission		

Local Public Review Period (to be filled in by lead agency)

Starting Date December 7, 2023 Ending Date January 12, 2024

Lead Agency (Complete if applicable):

Consulting Firm: Dudek
Address: 605 Third Street
City/State/Zip: Encinitas CA 92024
Contact: Matt Valerio
Phone: 760-479-4145

Applicant: Imperial County
Address: 801 Main Street
City/State/Zip: El Centro CA 92243
Phone: 442-265-1726

Signature of Lead Agency Representative: _____ **Date:** 12-5-2023

Authority cited: Section 21083, Public Resources Code. Reference: Section 21161, Public Resources Code.

Health Effects of Diesel Exhaust

A fact sheet by
Cal/EPA's Office of Environmental Health Hazard Assessment and
The American Lung Association of California.

Diesel fuel is widely used throughout our society. It powers trucks that deliver products to our communities, buses that carry us to school and work, agricultural equipment that plants and harvests our food, and backup generators that can provide electricity during emergencies. It is also used for many other applications. Diesel engines have historically been more versatile and cheaper to run than gasoline engines or other sources of power. Unfortunately, the exhaust from these engines contains substances that can pose a risk to human health.

In 1998, the California Environmental Protection Agency's Office of Environmental Health Hazard Assessment (OEHHA) completed a comprehensive health assessment of diesel exhaust. This assessment formed the basis for a decision by the California Air Resources Board (ARB) to formally identify particles in diesel exhaust as a toxic air contaminant that may pose a threat to human health. The American Lung Association of California (ALAC) and its 15 local associations work to prevent lung disease and promote lung health. Since 1904, the American Lung Association has been fighting lung disease through education, community service, advocacy and research.

This fact sheet by OEHHA and ALAC provides information on health hazards associated with diesel exhaust.

Diesel exhaust contains more than 40 toxic air contaminants

What is diesel exhaust?

Diesel exhaust is produced when an engine burns diesel fuel. It is a complex mixture of thousands of gases and fine particles (commonly known as soot) that contains more than 40 toxic air contaminants. These include many known or suspected cancer-causing substances, such as benzene, arsenic and formaldehyde. It also contains other harmful pollutants, including nitrogen oxides (a component of urban smog).

How are people exposed to diesel exhaust?

Diesel exhaust particles and gases are suspended in the air, so exposure to this pollutant occurs whenever a person breathes air that contains these substances. The prevalence of diesel-powered engines makes it almost impossible to avoid exposure to diesel exhaust or its byproducts, regardless of whether you live in a rural or urban setting. However, people living and working in urban and industrial areas are more likely to be exposed to this pollutant. Those spending time on or near roads and freeways, truck loading and unloading operations, operating diesel-powered machinery or

working near diesel equipment face exposure to higher levels of diesel exhaust and face higher health risks.

What are the health effects of diesel exhaust?

As we breathe, the toxic gases and small particles of diesel exhaust are drawn into the lungs. The microscopic particles in diesel exhaust are less than one-fifth the thickness of a human hair and are small enough to penetrate deep into the lungs, where they contribute to a range of health problems.

Diesel exhaust and many individual substances contained in it (including arsenic, benzene, formaldehyde and nickel) have the potential to contribute to mutations in cells that can lead to cancer. In fact, long-term exposure to diesel exhaust particles poses the highest cancer risk of any toxic air contaminant evaluated by OEHHA. ARB estimates that about 70 percent of the cancer risk that the average Californian faces from breathing toxic air pollutants stems from diesel exhaust particles.

Diesel exhaust increases the risk of cancer…

In its comprehensive assessment of diesel exhaust, OEHHA analyzed more than 30 studies of people who worked around diesel equipment, including truck drivers, railroad workers and equipment operators. The studies showed these workers were more likely to develop lung cancer than workers who were not exposed to diesel emissions. These studies provide strong evidence that long-term occupational exposure to diesel exhaust increases the risk of lung cancer. Using information from OEHHA's assessment, ARB estimates that diesel-particle levels measured in California's air in 2000 could cause 540 "excess" cancers (beyond what would occur if there were no diesel particles in the air) in a population of 1 million people over a 70-year lifetime. Other researchers and scientific organizations, including the National Institute for Occupational Safety and Health, have calculated cancer risks from diesel exhaust that are similar to those developed by OEHHA and ARB.

Exposure to diesel exhaust can have immediate health effects. Diesel exhaust can irritate the eyes, nose, throat and lungs, and it can cause coughs, headaches, light-headedness and nausea. In studies with human volunteers, diesel exhaust particles made people with allergies more susceptible to the materials to which they are allergic, such as dust and pollen. Exposure to diesel exhaust also causes inflammation in the lungs, which may aggravate chronic respiratory symptoms and increase the frequency or intensity of asthma attacks.

… And it can cause coughs and aggravate asthma

Diesel engines are a major source of fine-particle pollution. The elderly and people with emphysema, asthma, and chronic heart and lung disease are especially sensitive to fine-particle pollution. Numerous studies have linked elevated particle levels in the air to increased hospital admissions, emergency room visits, asthma attacks and premature deaths among those suffering from respiratory problems. Because children's lungs and respiratory systems are still developing, they are also more susceptible than healthy adults to fine particles. Exposure to fine particles is associated with increased frequency of childhood illnesses and can also reduce lung function in children.

Like all fuel-burning equipment, diesel engines produce nitrogen oxides, a common air pollutant in California. Nitrogen oxides can damage lung tissue, lower the body's resistance to respiratory infection and worsen chronic lung diseases, such as asthma. They also react with other pollutants in the atmosphere to form ozone, a major component of smog.

What is being done to reduce the health risks from diesel exhaust?

Improvements to diesel fuel and diesel engines have already reduced emissions of some of the pollutants associated with diesel exhaust. However, diesel exhaust is still one of the most widespread and toxic substances in California's air.

ARB's Diesel Risk Reduction Plan, when fully implemented, will result in a 75 percent reduction in particle emissions from diesel equipment by 2010 (compared to 2000 levels), and an 85 percent reduction by 2020. The plan calls for the use of cleaner-burning diesel fuel, retrofitting of existing engines with particle-trapping filters, and the use in new diesel engines of advanced technologies that produce nearly 90 percent fewer particle emissions, as well as the use of alternative fuels.

Diesel exhaust contributes to smog and fine-particle pollution

The use of other fuels, such as natural gas, propane and electricity offer alternatives to diesel fuel. All of them produce fewer polluting emissions than current formulations of diesel fuel. As a result of ARB and local air-quality regulations, public transit agencies throughout California are using increasing numbers of passenger buses that operate with alternative fuels or retrofitted equipment.

For further information

Office of Environmental Health Hazard Assessment

1001 I Street, P.O. Box 4010, Sacramento, CA 95812-4010
(916) 324-7572
www.oehha.ca.gov

Air Resources Board

1001 I Street, Sacramento, CA 95814
(800) 363-7664
www.arb.ca.gov

American Lung Association of California

921 11th Street, Suite 700, Sacramento, CA 95814
(916) 442-4446
For your local office, call (800) LUNG-USA
www.californialung.org

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see OEHHA's web site at www.oehha.ca.gov

ALEX PADILLA
U.S. SENATOR for CALIFORNIA
(https://www.padilla.senate.gov)

DECEMBER 13, 2023

Padilla Announces $367 Million in Funding for Colorado River Conservation Agreements and Salton Sea Restoration

WASHINGTON, D.C. — Today, U.S. Senator Alex Padilla (D-Calif.) announced that the Department of the Interior (DOI) awarded approximately $367 million to California partners to protect the Colorado River Basin, including nearly $295 million for several water conservation agreements with California water agencies and $72 million to restore the Salton Sea. The Colorado River Basin water conservation agreements — announced today by the Bureau of Reclamation — will enable California to conserve up to 643,000 acre-feet of water in Lake Mead through 2025.

The federal investment in the Salton Sea will speed up the implementation of California's 10-year Salton Sea Management Plan (https://saltonsea.ca.gov/) (SSMP) that Padilla advocated (https://www.padilla.senate.gov/newsroom/press-releases/padilla-feinstein-ruiz-vargas-applaud-historic-250-million-federal-investment-at-the-salton-sea/) for to bolster drought resiliency, protect important wildlife habitats, and accelerate dust suppression to protect air quality. Funding for these agreements comes from the *Inflation Reduction Act* (IRA).

"In the face of historic drought and the climate crisis, California water agencies have led the way in developing creative solutions to protect our water supply," **said Senator Padilla.** "I am glad to see this *Inflation Reduction Act* funding flow to California water users who voluntarily stepped up to conserve water and keep the system afloat. I fought hard to ensure that the *Inflation Reduction Act* included measures to restore the environmental and public health crises at the Salton Sea, and I'm grateful to the Department for this significant investment in improving conditions at the Salton Sea. Securing these agreements will allow us to turn toward the hard work of crafting post-2026 guidelines and building long-term resiliency in the Basin."

"These agreements represent another critical step in our collective efforts to address the water management challenges the Colorado River Basin faces due to drought and climate change," **said Reclamation Commissioner Camille Calimlim Touton.** "Addressing the drought crisis requires an all-hands-on-deck approach, and close collaboration among federal, state, Tribal and local communities. When we work together, we can find solutions to meet the challenges of these unprecedented drought conditions."

The $295 million for California water users will fund projects for water conservation, water efficiency, and protection of critical environmental resources in the Colorado River System. Bureau of Reclamation Commissioner Camille Calimlim Touton joined federal, Tribal and state leaders in Nevada today at the Colorado River Water Users Association (CRWUA) meeting to announce these agreements with partners. Padilla also joined the Colorado River Board of California virtually today to thank the water users for their conservation and to discuss the challenges still ahead.

This funding includes agreements with the Coachella Valley Water District to save up to 105,000 acre-feet of water through 2025 and the Quechan Indian Tribe to save up to 39,000 acre-feet through 2025. Interior also recently signed an agreement (https://www.doi.gov/pressreleases/biden-harris-administration-announces-new-agreement-imperial-irrigation-district-save) with the Imperial Irrigation District to conserve approximately 100,000 acre-feet of water in 2023. Additional system conservation agreements with the Palo Verde Irrigation District and Bard Water District, in cooperation with the Metropolitan Water District of Southern California, are expected to be finalized in the coming weeks.

The $72 million funding for the Salton Sea restoration is part of a generational, $250 million investment through the SSMP and will complement the $583 million in state funding committed to date. The investment includes:

- $70 million to the state of California to fund expansion of the Species Conservation Habitat Project, which will create up to 7,000 acres of aquatic habitat for wildlife and cover exposed lakebed.
- $2 million to the Torres Martinez Desert Cahuilla Indians over five years to expand the Tribe's technical capacity by funding positions entrusted with supporting Salton Sea project implementation.

Last year, Senator Padilla worked to ensure (https://www.padilla.senate.gov/newsroom/press-releases/padilla-statement-on-passage-of-historic-inflation-reduction-act/) that the *Inflation Reduction Act* included $4 billion for drought resiliency and inland waterways, including for projects to address historic drought impacting the Colorado River Basin and Salton Sea. He secured (https://www.google.com/url?q=https://www.padilla.senate.gov/newsroom/press-releases/icymi-governor-newsom-ca-leaders-applaud-feinstein-padilla-efforts-to-secure-critical-funding-for-drought-resiliency-in-inflation-reduction-act%25ef%25bf%25bc/&sa=D&source=docs&ust=1702417137476811&usg=AOvVaw3HxX69kFNWQ4HEGr1JoYPB) new funding to compensate water users for voluntary water use reductions, with a priority for users who receive water from the Colorado River, which will help blunt impacts to California communities as the state continues its collaborative efforts to reach an agreement with the seven River Basin states on how to sustain the River. The IRA will also fund long-term drought resiliency projects on the Colorado River.

The funding Padilla secured will also allow DOI (https://www.padilla.senate.gov/newsroom/press-releases/padilla-feinstein-ruiz-vargas-applaud-historic-250-million-federal-investment-at-the-salton-sea/) to contribute to vital restoration projects at the Salton Sea, including to expedite existing projects that the State of California and California water users are contributing to. Last Congress, Padilla also successfully enacted his *Salton Sea Projects Improvements Act (https://www.padilla.senate.gov/newsroom/press-releases/padilla-feinstein-bill-to-improve-air-water-wildlife-quality-at-salton-sea-advances-in-senate%ef%bf%bc/)* to give the Interior Department additional authorities to participate in Salton Sea projects.

###

Related Issues

ENERGY AND ENVIRONMENT (HTTPS://WWW.PADILLA.SENATE.GOV/ABOUT/ISSUES/ENVIRONMENT/)

International Energy Analysis Department
Energy Analysis and Environmental Impacts Division
Lawrence Berkeley National Laboratory

Why Regional and Long-Haul Trucks are Primed for Electrification Now

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March 2021

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Why regional/long-haul trucks are primed for electrification now

A. Phadke[*], A. Khandekar[*], N. Abhyankar[*], D. Wooley[#], D. Rajagopal[&,%]

Abstract

Zero emission freight trucks are needed to both improve public health and reduce global greenhouse gas emissions but at the same time are generally believed to be uneconomical. However, recent dramatic declines in battery prices and improvement in their energy density have created opportunities for battery-electric trucking today that were seldom anticipated just a few years ago. At the current global average battery pack price of $135 per kilowatt-hour (kWh) (realizable when procured at scale), a Class 8 electric truck with 375-mile range and operated 300 miles per day when compared to a diesel truck offers about 13% lower total cost of ownership (TCO) per mile, about 3-year payback and net present savings of about US $200,000 over a 15-year lifetime. This is achieved with only a 3% reduction in payload capacity. Even this small penalty can be reversed cost-effectively through light-weighting, in any case, only matters for a small fraction of trucks which regularly utilize their maximum payload. Electric trucks appear poised to also meet the performance demands for a large share of regional and long-haul trucking today. The estimated average distance traveled between 30-minute driver breaks is 150 miles and 190 miles for regional-haul and long-haul trucks respectively in the US. Thirty minutes of charging using 500 kW or mega-Watt scale fast-chargers would add sufficient range without impairing operations and economics of freight movement. However, as with almost any clean technology, higher upfront capital costs of both vehicles and charging infrastructure are major barriers when electric trucking is in its infancy. Without strong policy support, coordinated investments in both vehicle manufacturing and fuel infrastructure will not be forthcoming on the scale needed to harness the true potential of battery electric trucks.

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Executive Summary

Globally, heavy-duty vehicles (primarily trucks) are estimated to comprise only about 11% of the motor vehicles, yet account for close of half the total CO_2 emissions from motor vehicles and 71% of vehicle particulate emissions (PM) (Kodjak, 2015). The latter are responsible for the vast majority of air pollution related deaths worldwide (Landrigan et al., 2017). Furthermore, low-income communities everywhere bear a disproportionate proportion of the health burden from freight movement. For instance, it is estimated that in California, African American, Latino, and Asian Californians experience respectively 43, 39, and 21% higher level of $PM_{2.5}$ pollution from cars, trucks, and buses relative to white Californians (Union of Concerned Scientists, 2019). Zero emission freight trucks are critical to both reducing global greenhouse gas emissions and improving public health. This paper shows that recent dramatic improvements in battery technology have primed heavy-duty trucks for near-term electrification.

At the current global average battery pack price of $135 per kilowatt-hour (kWh) (realizable when procured at scale), a Class 8 electric truck with 375-mile range and operated 300 miles per day when compared to a diesel truck offers about 13% lower total cost of ownership (TCO) per mile, about 3-year payback and net present savings of about US $200,000 over a 15-year lifetime. This is achieved with only a 3% reduction in payload capacity. Even this small penalty can be reversed cost-effectively through light-weighting, which in any case, only matters for a small fraction of trucks which regularly utilize their maximum payload. This accounts for a 3% reduction in payload capacity, though that loss can be avoided cost-effectively through light-weighting and is only consequential for a small fraction of operations that regularly utilize the truck's maximum payload. Battery prices are projected to decline to about $60 per kWh by 2030 accompanied by further improvement in energy density and efficiency. These advances, combined with state or federal polices to monetize pollution reduction benefits, could make electric truck TCO over 40% lower relative to TCO for diesel today.

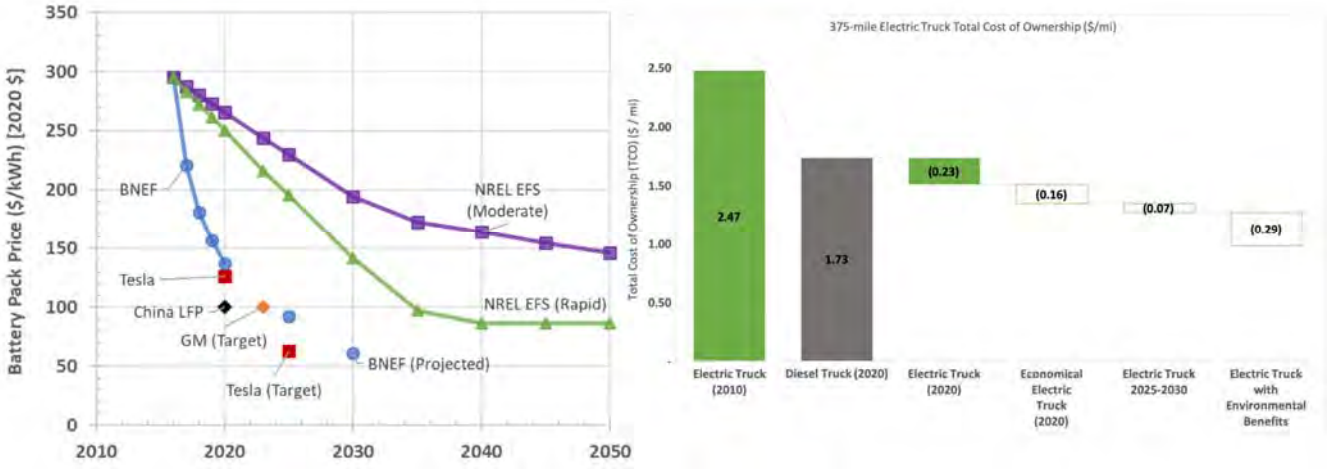
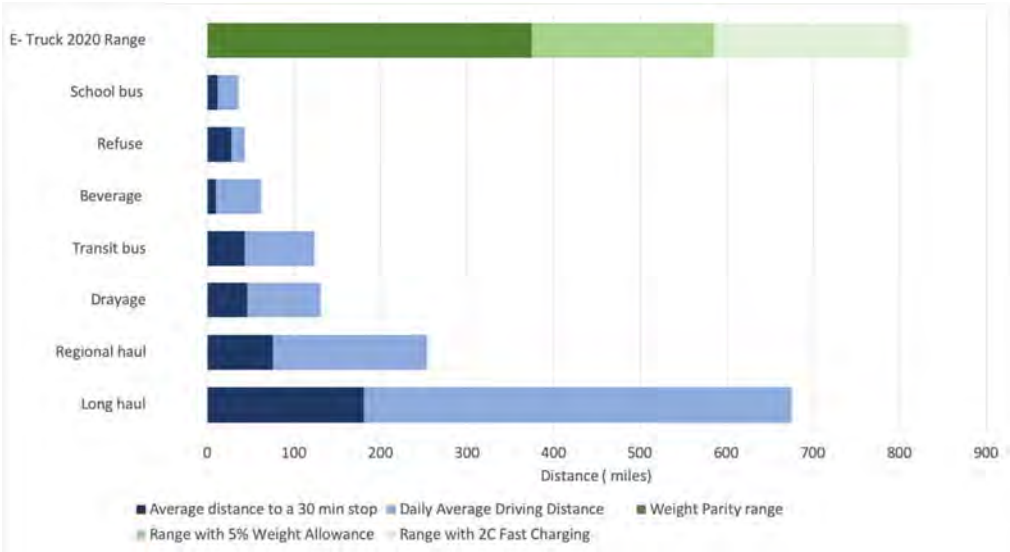


Figure ES1: Electric trucks can offer significant savings due to dramatic decline battery prices and opportunities for economical charging. The graph on left shows the estimated actual prices from 2010 to 2020 by BNEF (solid blue line with circular markers) and projections by BNEF going forward (blue circular markers without a solid line). It also shows projections made by National Renewable Energy Laboratory (NREL) as of 2017 looking into the future under two different scenarios of cost reduction (Moderate and Rapid) as well as a few additional data points such as individual targets for GM and Tesla. Figure on the right shows the total cost of ownership under different scenarios we estimate in this report. ***Data Sources***: Battery pack prices - National Renewable Energy Laboratory, Electrification Futures Study [EFS] (Jadun et al., 2017) and (BNEF, 2020).



ES2: Electric trucks can have sufficient range for most applications without materially compromising payload. Figure depicts a comparison of average daily distance for different

vehicle types, their average distance to a 30-minute or longer stop and our estimate of potential range for a 375-mile Class 8 Truck with 5% additional weight allowance for the battery and 2C fast charging availability Source: For data on driving distances refer (Oak Ridge National Laboratory, 2019).

As vehicle battery costs have fallen, so has their weight and size. These physical changes accompany a steadily rising energy density. As a result, electric trucks with a range up to 375 miles (300 miles at 80% maximum depth of discharge (DoD)) might entail little to no reduction in payload carrying capacity. An often-overlooked fact is that the electric drive train is substantially lighter relative to a diesel drive train, which offsets a significant amount of battery pack weight. Lightweighting and improved aerodynamics using commercially available technology can enable additional range up to 450 miles. (North American Council for Freight Efficiency, 2015). Further, since most truck trips tend to be limited by volumetric capacity of payload as opposed to payload weight, a 5% payload weight penalty for reducing fuel cost significantly is likely to be acceptable for most trucks. Additionally, the Federal Motor Carrier Safety Administration (FMCSA) has several restrictions on the hours of driving by truck drivers (FMCSA 2015). For example, the maximum continuous driving without a 30 minute mandatory break is 8 hours (which translates to a distance of about 450 miles) and a range of 500 miles will be sufficient to cover the maximum allowed continuous driving. Additional FMCSA driving limits include the 14-hour "driving window" limit, 11-hour driving limit, and 60-hour/7-day and 70-hour/8-day duty limits. The maximum driving allowed in a 14-hour driving window is 11 hours, after which a mandatory break of 10 hours is required. Range of 200 to 400 miles can be added (with 1C and 2C charging rate) in a 30-minute break sufficient to cover the remaining allowed three hours of driving (distance of about 170 miles). Note the scenario described above is to show that a 500-mile range electric truck has sufficient range to enable the maximum allowed driving. For a typical driving schedule, a 300-mile range might be sufficient. For example, a representative duty cycle for long haul trucks estimated by DOE-NREL indicates more than a 30-minute break after 3-4 hours (less than 250 miles) of driving which is followed by another 3-4 hours of driving after which there is more than 10-hour break with a total distance of about 500 miles. ORNL 2019 finds that the average distance to a 30-minute stop which can be used to add significant range with fast charging is 190 miles and 150 miles for a long haul and regional haul trucks, which constitute the majority (about 70%) of the diesel consumed and emissions by trucking. For these reasons, we argue that electric trucks can have sufficient range for most applications in the near future.

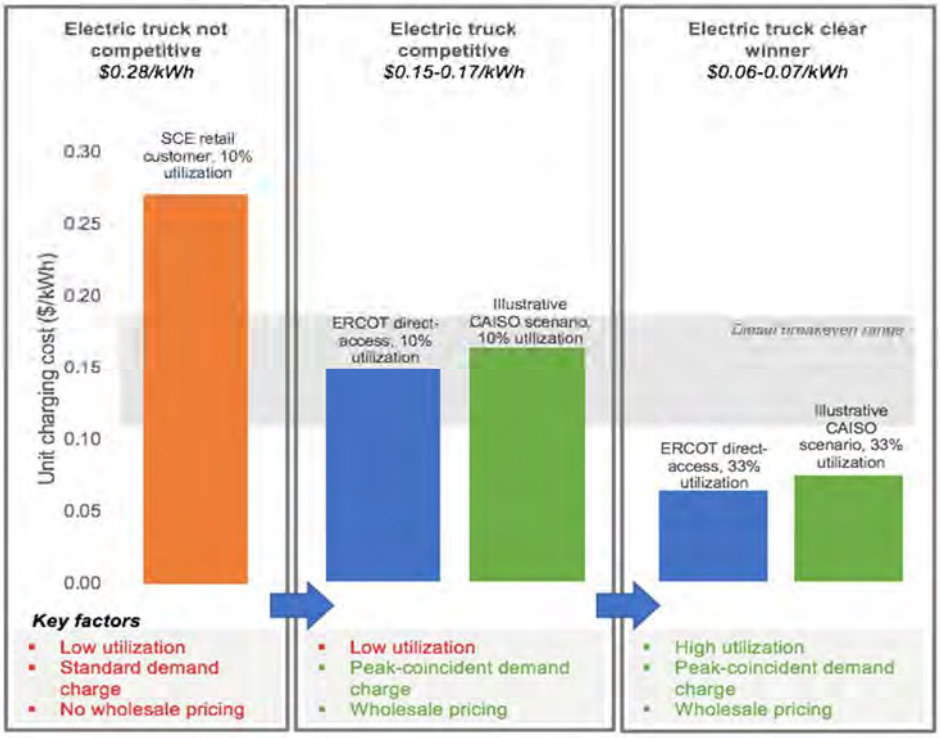
Although electric trucks present an enormous opportunity both from economic, environmental, and environmental justice standpoints, major barriers need to be addressed to fully realize their potential and an appropriate policy ecosystem is required to stimulate and facilitate the transition from diesel to electric long-haul trucking. First, as is often the case in early stages of clean energy technology commercialization, electric trucks carry higher up-front costs than conventional trucks (for both vehicles and charging infrastructure). This is due to lack of scale economies and market uncertainty. For instance, simple calculations suggest that the 13% lower TCO notwithstanding, at the current battery price of $135/kWh, a 375-mile range truck with a 797-kWh battery pack has an upfront cost that is 75% greater relative to a diesel truck, which experience suggests is a major barrier to adoption. This price differential is not expected to last long, but strongly suggests the need for early-adopter subsidies to drive sales, and lower capital costs through manufacturing economies of scale.

Second, as battery costs decline, charging related costs are beginning to loom larger. Whereas a decade ago, when battery costs were in excess of $1000/kWh, charging-related costs would have accounted for about 15% to 18% of the TCO, today they account for 25% to 30% and increase further as battery prices decline. Figure ES3 shows the effect of electricity price retail price demand charges and at wholesale prices without “demand” charges which are levied based maximum instantaneous power consumption during a specified billing period and are distinct from energy charges. Electricity prices, especially demand charges, but also energy charges, that do not reflect the true cost to the system is a barrier to electrification of commercial vehicle fleets in general but especially for long-haul trucks. There is a need for electricity tariffs that send the right price signals for truck charging and avoid without imposing unfair costs or truck owners or other customers

Third, it will take time to achieve high utilization rates for vehicle charging infrastructure, which is essential to realizing a low levelized cost of infrastructure per unit of delivered electricity to vehicles. Figure ES3 shows the effect of low and high utilization of charge infrastructure on total cost of charging, which is the sum of the cost of electricity and the levelized cost of infrastructure.

Realizing the full economic potential of electric trucks therefore requires surviving a long period of infancy marked by low demand for vehicles and charging, and consequently, higher cost of new vehicles and slow return on charging infrastructure. Faced with such barriers, absent public intervention, private investments in electric trucks will occur at a level lower

than is socially optimal. Given the importance of addressing pollution from trucking, strong policy support for the coordinated and large-scale investments in vehicle technologies and fuel infrastructure is warranted to harness the economic and environmental potential of battery electric trucks. Binding targets for vehicle sales, supported by targeted subsidies indexed both to international battery prices and cumulative sales can deliver the scale of adoption needed to launch this new industry on a sustainable future trajectory.



ES3: Rational electricity tariffs and improved charging infrastructure utilization can significantly improve the economics of electric trucks (Phadke et al., 2019)

1. Introduction

Globally, heavy-duty vehicles are estimated to comprise only about 11% of the motor vehicles, yet account for close of half the total CO2 emissions from motor vehicles and 71% of vehicle particulate emissions (PM) (Kodjak, 2015). The latter are responsible for the vast majority of air pollution related deaths worldwide (Landrigan et al., 2017). For instance, in the U.S., heavy-duty trucks comprise 5% of the on-road traffic but account for 30% and 36% of vehicle CO2 emissions and particulate emissions respectively (Kodjak, 2015) while trucking as a whole account for 83% of all freight related CO2 emissions (Schipper et al.,

2011). Heavy-duty trucking's share to the environmental footprint of developing countries is even greater. For instance, in India which has low car ownership per capita relative to higher income countries, the such truck comprise 5% of the vehicle fleet but comprise 71% of CO_2, 74% of PM and 55% of NO_x emissions from on-road vehicles (Apte et al., 2017; Guttikunda & Mohan, 2014; Kodjak, 2015). Furthermore, world over low-income groups world-wide bear a disproportionate proportion of the environmental burden from freight movement. For instance, it is estimated that in California, African American, Latino, and Asian Californians experience respectively 43, 39, and 21% higher level of $PM_{2.5}$ pollution from cars, trucks, and buses relative to white Californians (Union of Concerned Scientists, 2019). Zero emissions trucks can significantly improve health outcomes for vulnerable populations.

Of the two leading zero emissions vehicle (ZEV) technologies – battery electric vehicles and hydrogen fuel cell vehicles, the focus here is on the former, which has experienced the most dramatic improvements on multiple fronts.[1] Battery cost and energy density have historically been barriers for heavy-duty battery electric vehicles (including medium and heavy-duty trucks and transit buses). But today the situation is dramatically different.

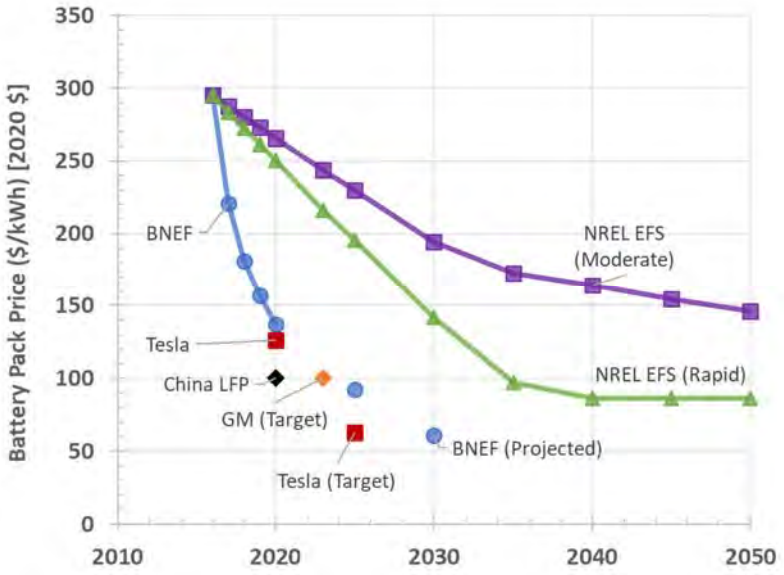


Figure 1. Battery prices have been consistently reducing more rapidly than projections (Jadun et al., 2017), (BNEF, 2020). Figure shows the estimated actual prices from 2010 to 2020 by

[1] According to the California Air Resources Board (CARB), for short and medium haul trucks, the total cost of ownership (TCO) for battery electric trucks is less than half that of hydrogen fuel cell trucks in the short to medium term (2018-24) and somewhat higher in the long term (2030) (California Air Resources Board 2019). Although we do not estimate the TCO of hydrogen fuel cell trucks in this analysis, our TCO estimates for 375-mile long-haul electric trucks ($1.51/mile) is substantially lower than CARB TCO estimate for hydrogen fuel cell trucks for regional delivery ($2.3/mile and $1.5/mile) for the short and medium term (2018-24)

BNEF (solid blue line with circular markers) and projections by BNEF going forward (blue circular markers without a solid line). It also shows projections made by National Renewable Energy Laboratory (NREL) as of 2017 looking into the future under two different scenarios of cost reduction (Moderate and Rapid) as well as a few additional data points such as individual targets for GM and Tesla. ***Data Sources***: Battery pack prices - National Renewable Energy Laboratory, Electrification Futures Study [EFS] (Jadun et al., 2017) and (BNEF, 2020).

One major recent development is the decline in battery prices. By 2020, lithium-ion battery costs had declined to roughly $136/kWh, an 85% decline relative to prices in 2010 (Figure 1) and are projected to reach a price of $55 per kWh in 2030 (Holland, 2018). Data from China, which has the most amount of heavy-duty electric vehicles (primarily buses) shows that battery prices for buses and other heavy duty vehicles are somewhat lower than the average battery prices for light-duty EVs in China and globally (BNEF, 2020). While some of this difference in the average price of battery pack price for HDVs in China and rest of the world is attributable to use of different types of battery chemistries[2] the production of heavy-duty EVs in China is much greater than any other country in the world. Therefore, with economies of scale the price of battery packs for HDVs is likely to come close price of battery packs for passenger EVs as is the case in China, as pointed out by others as well (See California Air Resources Board, 2019; Hall & Lutsey, 2019).

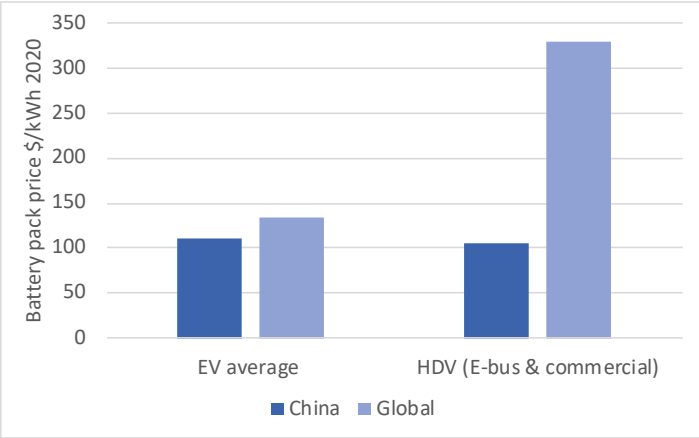


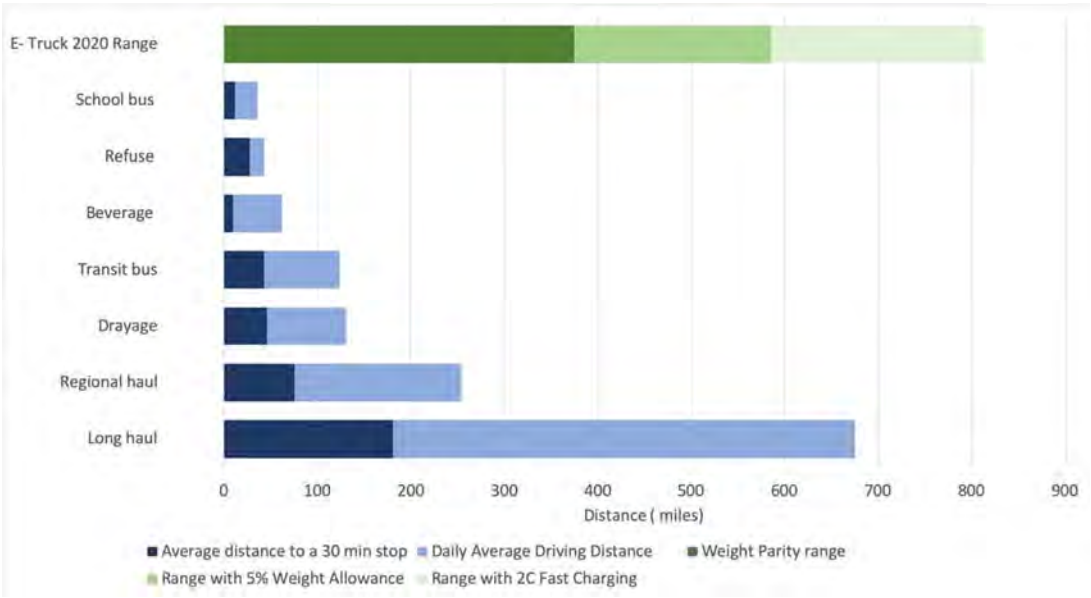
Figure 2: A comparison of average EV battery prices globally and in China across all vehicle types and specifically, prices for batteries in heavy-duty vehicles. Source: (BNEF, 2020)

[2] China currently relies more on Lithium Iron Phosphate (LFP) which is among the cheaper types of chemistries in use today when compared to say, Lithium Nickel Cobalt Aluminum Oxide (NCA) or Lithium Nickel Manganese Cobalt (NMC))

A second related development concerns battery weight, an especially significant factor for long-haul trucks, which are subject to maximum gross vehicle weight limits. In the US, federal laws limit maximum gross vehicle weights to 80,000 pounds on interstate highways (Federal Highway Administration, 2019) of which the tractor itself accounts for about 17,000 pounds (US Department of Energy, 2010), thus leaving about 63,000 pounds for revenue-generating payload. A widespread concern is that battery weight of an EV results in a reduction in allowed payload capacity, a factor that discourages EV adoption. As with battery cost, however, energy density at the cell-level (and by extension at the pack level) has also been improving steadily, resulting in significant reductions in battery weight. (Field, 2020). While the lower energy density of batteries and higher weight (relative to diesel engine and fuel) is perceived as a market barrier, critics of battery electric trucks often overlook the offsetting weight reduction from elimination of engine, cooling system, transmission and accessories. These parts account for about a quarter of the weight of a diesel tractor, which battery packs nearly eliminate. As described below, the weight difference between and battery electric and diesel trucks is small (resulting in a potential payload loss of about 5%) and is likely to fall lower as light-weighting techniques are employed. Moreover, data from the North American Council for Freight Efficiency shows that the average truck payload is less than 45,000 pounds (~70% of the maximum payload capacity) (North American Council for Freight Efficiency & Rocky Mountain Institute, 2018). Hence, for most cargo movement, payload is no longer a constraint for battery electric trucks.

A reason that attracts attention to battery electric trucks is the decreasing cost and carbon emissions of electric power. While electric trucks certainly reduce exposure of vulnerable populations to diesel pollution, their life cycle environmental benefits depend in large part on the source of electricity used for charging the batteries. In this context, a third key development is the fact that decline in battery prices is complemented by the steep drop in cost of electricity generation from clean renewables such as solar and wind, and the corresponding decline in GHG pollution of the average grid electricity. In fact, costs of renewable electricity have declined to such an extent that it is cheaper than or in parity with the levelized cost of generation from new coal plants (Lazard, 2018). Given current national and international ambitions to decarbonize the electric grid and growing prospects for deep CO2 reduction by the 2030's, electric trucks offer a pathway to near elimination of air pollution and GHG emissions from road freight operations. However, as we point of later aligning retail tariffs with generation prices is an area that needs policy attention.

There is also growing evidence that fast charging can be accomplished without significant impact on battery life. Studies comparing the impact of fast charging[3] and slow charging on battery cells degradation found a significant decrease in cycle life with fast-charging relative to slow charging only at temperatures above 30 degree Centigrade (Den Boer et al., 2013; Teslarati, 2017; The Tesla team, 2019). Controlling battery temperature through battery management systems and better cooling, a practice that is becoming widespread in commercial EVs, mitigates battery degradation concerns. A 1 Megawatt (MW) fast charger can deliver about 500 kilowatt-hours (kWh) in 30 minutes which at an energy economy of 2 kWh per mile amounts to 250 miles worth recharge. Additionally, actual data on commercial fleet operations reported by National Renewable Energy Laboratory's (NREL) Fleet DNA tool suggests that the 80th percentile of daily distance travelled by long-haul tractors is about 600 miles and that the average distance to a 30-minute stop is less than 200 miles (Oak Ridge National Laboratory, 2019). As heavy-duty battery electric trucks continue to improve it is likely that even faster charging rates and range improvement will become common (due to gradually increasing battery energy-density and decreasing HDV vehicle weight). Extreme fast charging is one important aspect that is still in its infancy that needs targeted investments and incentives at this stage.



[3] Charging and discharging rates are often referred to in terms of C-rates. Basically, the C-rate denotes the number of times it can be fully charged in 1 hour. A 50kWhr battery when charged from zero to full charge in 1hour is said to be charged at the 1C rate while if it is fully charged in only 30 minutes it is referred to as 2C charging because it can be fully charged twice in 1 hour. If it is charged from zero to full in 2 hours it is 0.5C charging. Charging a 500kWhr battery at 0.5C 1C, and 2C rates will require 250KW, 500kW and 1MW fast charger respectively. Charging a 1000 kWh battery at 0.5C 1C, and 2C rates will require 500kW, 1MW and 2 MW fast charger respectively.

Figure 3: Comparison between average daily distance for different vehicle types, their average distance to a 30-minute or longer stop and our estimate of potential range for a 375-mile Class 8 Truck with 5% additional weight allowance for the battery and 2C fast charging availability. Source: For data on driving distances refer (Oak Ridge National Laboratory, 2019).

Multiple studies have examined the potential for electrification (Çabukoglu et al., 2018; California Air Resources Board, 2019; B. A. Davis & Figliozzi, 2013; Den Boer et al., 2013; Earl et al., 2018; Gopal et al., 2017; Karali et al., 2019; Lee & Thomas, 2017; Liimatainen et al., 2019; Mareev et al., 2017; Moultak et al., 2017; Sen et al., 2017; Sripad & Viswanathan, 2019; Taefi et al., 2017; Talebian et al., 2018; Tanco et al., 2019; Zhou et al., 2017). Several assume battery-electric trucks to be an infeasible option for replacing conventional diesel trucks, particularly long-haul trucks on account of large battery capacity requirements, range anxiety, and uncertainty related to availability of charging infrastructure (Çabukoglu et al., 2018; Den Boer et al., 2013; Earl et al., 2018; Lee & Thomas, 2017; Liimatainen et al., 2019; Moultak et al., 2017; Taefi et al., 2017; Talebian et al., 2018; Zhou et al., 2017). Of studies that actually evaluate the economic performance of electric trucks (California Air Resources Board, 2019; Den Boer et al., 2013; Earl et al., 2018; Lee & Thomas, 2017; Mareev et al., 2017; Sen et al., 2017; Sripad & Viswanathan, 2019; Taefi et al., 2017; Tanco et al., 2019; Zhou et al., 2017), several consider or conclude battery-electric trucks to be a solution for only light- and medium-duty trucks with a low daily range of less than ~250 miles (Den Boer et al., 2013; Lee & Thomas, 2017; Moultak et al., 2017; Taefi et al., 2017; Tanco et al., 2019; Zhou et al., 2017). Certain studies deem long-haul electric trucks, which have greater than 250-mile daily range, unviable specifically because of range anxiety due to a lack of fast charging (Karali et al., 2019; Moultak et al., 2017; Talebian et al., 2018). However, a few more recent studies analyze battery-electric trucks as an option for long-haul transportation (California Air Resources Board, 2019; Sripad & Viswanathan, 2019; Tanco et al., 2019).

Different from many earlier studies, this work relies on bottom-up cost, weight and performance estimation and latest market data to improve on the existing long-haul electric truck literature. We estimate the TCO of an electric truck compared to a diesel truck based on bottom-up truck technical specifications generated from a vehicle dynamic model (detailed in the methods and data section). We fully account for recent trends toward lower-cost, higher-energy-density batteries. We include additional cost reduction potential from monetizing air pollution and GHG reductions. Our charging costs account for levelized cost

of fast-charging infrastructure and demand charges as part of electricity cost. Finally, we provide detailed comparisons of the weights of diesel versus electric long-haul trucks based on the Tesla semi, with consideration of commercially available light weighting options. The results provide the most comprehensive techno-economic analysis of long-haul electric trucking to date.

2. Methods and Data

We investigate the potential for a Class 8 electric truck to seamlessly replace a Class 8 diesel truck based on economics and performance. Class 8 trucks were chosen as the reference model for this analysis because they consume nearly 20% of all energy consumed by the U.S. transport sector (S. C. Davis et al., 2017). Furthermore, the CALSTART Zero-emissions technology inventory list up to 31 existing models of heavy-duty battery electric trucks with 23 more announced to be launched. For reference, there are 3 existing models and 6 announced models of hydrogen fuel-cell electric trucks (CALSTART 2020). The diesel truck model for this estimation is the Volvo VNL 400 (Legacy Truck Centers, 2019) truck, and the electric truck model is the Tesla Semi (Tesla, 2019).

Below, Section A describes the battery pack capacity estimation for a Class 8 electric truck using our vehicle dynamic model. Section B describes our TCO estimation. Section C shows the analysis for estimating the weight of the battery pack for a commercially available Class 8 truck. It is worth emphasizing that our study draws on both bottom-up estimations and industry claims: we analyze TCO based on a bottom-up battery pack size estimate from the vehicle dynamic model, whereas the battery pack weight estimation is based on existing commercial trucks (in this case the Tesla Semi). The entire set of calculations is carried out in a spreadsheet and is available for download along with this report.

2.1 Vehicle Dynamic Model

We use the vehicle dynamic model represented in Equation 1 to estimate required battery pack size (E_P, in kWh) based on the standard performance requirements of a Class 8 diesel truck.

$$E_p = \left[\frac{\left(\frac{1}{2}\rho * C_d * A * v_{rms}^3 + C_{rr} * W_T * g * v + t_f * W_T * g * v * Z\right)}{\eta_{bw}} + \left(\frac{1}{2} W_T * v * a \left(\frac{1}{\eta_{bw}} - \eta_{bw} * \eta_{brk}\right)\right)\right] * \frac{D}{v} \quad (1)$$

Table 2 lists the parameters used to estimate the battery pack size.

Table 2. Vehicle Dynamic Model Input Parameters (Derived from Sripad and Viswanathan, 2017)

Category	Parameter	Representation in Equation 1	Value	Unit
Body (Alternative Fuels Data Center, 2020)	Gross vehicle weight (including payload and battery pack)	W_T	36,000	kg
	Coefficient of drag	C_d	0.45	
	Coefficient of rolling resistance	C_{rr}	0.0063	
	Braking efficiency	η_{brk}	0.97	
	Drivetrain efficiency	-	0.90	
	Battery discharge efficiency	-	0.95	
	Battery-to-wheels efficiency (product of battery discharge efficiency, drivetrain efficiency, and braking efficiency)	η_{bw}	0.83	
	Frontal area of truck	A	7.20	m^2
Use Characteristics	Daily driving distance	D	300 or 400	miles
	Average velocity (Sripad & Viswanathan, 2017)	v	19	m/s
	Root mean square velocity (Sripad & Viswanathan, 2017)	v_{rms}	22	m/s
	Average acceleration/deceleration (Sripad & Viswanathan, 2017)	a	0.112	m/s^2
	Road grade (Sripad & Viswanathan, 2017)	r	1%	
	Fraction of time driven on road grade r (Sripad & Viswanathan, 2017)	t_f	15%	
	Average road gradient (r/100) (Sripad & Viswanathan, 2017)	Z	0.0001	
	Air density	ρ	1.20	kg/m^3

Category	Parameter	Representation in Equation 1	Value	Unit
Environmental Characteristics	Acceleration due to gravity	g	9.8	m/s^2

2.2 Total Cost of Ownership Model

We address TCO primarily on a per-mile basis, summing the unit capital cost, unit maintenance cost, unit fuel cost, and unit general operation costs (Equation 2). We assume the fuel cost of an electric truck comprises electricity cost and the levelized cost of the charging equipment (Equation 3). We compute the unit capital cost of an electric truck as the unit capital cost of a diesel truck plus the capital cost of the battery and electric power train minus the cost of the avoided diesel truck components such as the power train, fuel and fuel tank etc.

Unit cost of ownership = unit capital cost + unit fuel cost +
unit maintenance cost + unit operation costs *(2)*

Unit fuel cost (electric truck) = unit electricity cost +
unit cost of charging equipment *(3)*

Unit capital cost (electric truck) = unit capital cost (diesel truck) + battery and related component costs – avoided diesel truck component costs *(4)*

The cost of electric powertrains is less than one third the cost of diesel powertrains—savings that are not considered by previous studies. The major component of the incremental capital cost of an electric truck is the battery cost, which we base on the battery pack size generated from the vehicle dynamic model. We amortize incremental capital cost to estimate per-mile incremental capital cost, which is primarily driven by battery prices and the range of electric trucks (which determines the battery size). We estimate operations, maintenance, and diesel fuel costs based on empirical data. Table 3 summarizes the parameters used for estimating all the components of Equation 2. We account for depreciation of battery and factor in the cost of replacement cost, but we ignore the depreciation of the vehicle as a whole. This is likely conservative with respect to EVs given that they incur lower maintenance and repair expenses and consequently a potentially longer asset life. In any case, there has been

insufficient experience to estimate a distinct EV depreciation schedule except for the battery pack alone which can be approximated based on total charge and discharge cycles.

To estimate electric truck fuel costs, we draw on a complementary bottom-up estimate of charging cost (Phadke et al., 2019) that includes electricity and fast-charging infrastructure costs. The unit cost of the charging equipment is the minimum price per unit of energy delivered (kWh) that a charging service provider should charge consumers to break even on the investment in charging equipment and grid interconnection. The unit cost is a function of 1) the useful service life of the charging equipment, and 2) the utilization rate in terms of average kWh/day delivered. We do not explicitly conduct these analyses in this paper but rather draw on the model of Phadke et al., 2019. These results, which comprise the components of Equation 3, are summarized in Table 3.

In addition to a base case scenario, which uses current international battery pack price (as estimated and reported by BNEF), we evaluate cost and performance given plausible future developments on multiple fronts. We consider the effects of an aerodynamically superior design of the truck with a 45% lower drag co-efficient (declining from 0.45 to 0.25) which improves fuel economy by about 10% from 2.1 kWh/mi to 1.9 kWh/mi. We also consider the potential for charging at lower cost by ~60% ($0.1/kWh as opposed to $0.16/kWh in the base case) by procuring electricity at prices that more closely track wholesale electricity price as opposed to cost of retail service. We also evaluate the effect of a decline in battery price from $135 per kWh to $60 per kWh. Lastly, we allow for the monetization of air pollution/GHG emissions benefits from avoided emissions, which further reduces the TCO.

Table 3. Input Parameters for TCO Model

Unit capital cost components[4]		
2020 Battery pack cost (Holland, 2018)	$135 (2030 Price $60)	$/kWh
Battery life[5]	2,000	cycles
Battery size	375 or 500	kWh
Annual mileage[6]	78,0000 or 104,000	miles/year
Life of truck (Ritter, 2018)	15	years
Cost of truck without battery and allied drivetrain	$85,000	$
Real discount rate[7]	6.9%	
Unit fuel cost components		
Fuel efficiency of electric truck[8]	2.1	kWh/mile
Fuel efficiency of diesel truck (Alternative Fuels Data Center, 2020)	5.9[9]	miles/gallon
Amortized charging infrastructure cost[10]	$0.03	$/kWh
Electricity price[10]	$0.13	$/kWh
Diesel price (EIA, 2019)	$3.30	$/gallon
Unit maintenance cost components		
Diesel maintenance cost	$12,000–$30,000	$/year
Electric maintenance cost[11]	$6,500	$/year
Battery replacement cost (year 7) (Holland, 2018)	$100[12]	$/kWh
Unit operation cost components		
General operation costs	$0.76	$/mile

[4] Taxes on vehicles and components are excluded from this analysis and recognize that with higher upfront cost and component costs, electric vehicles could come out a bit costlier, but our sensitivity analyses will show that taxes are unlikely to change the basic conclusions.

[5] Based on expert input

[6] Assuming an average daily driving distance of 300 miles for a 375-mile range truck and 400-miles for a 500-mile range truck so as to achieve an average daily depth of discharge of battery of 80% and 260 days of driving for any truck

[7] Derived assuming nominal discount rate of 9%

[8] Result of VDM; validated by industry numbers

[9] Latest models of diesel trucks have high fuel economy but we anticipate such trucks to be costlier as well and we intend to addressed this in sensitivity analysis.

[10] Derived from Phadke et. al. 2019

[11] Estimated based on Cannon (2016)

[12] It is worth pointing out that diesel trucks need an engine rebuild after about 500,000 miles which makes our estimate conservative

2.3 Class 8 Truck Battery Pack Weight Estimation

Four components contribute to the weight of a standard battery pack module used in vehicles: 1) cells, which store energy; 2) busbars, which act as the transmission system for the battery pack; 3) cooling tubes, which maintain optimal ambient temperature within the pack; and 4) an outer case for protecting the pack against physical damage. Here we estimate the weight of a 797- and a 1,062-kWh pack, which are estimated to be the size of the battery pack used to power the 375- and the 500-mile-range Tesla semi models. To derive the weight of the semi packs, we use the component weights for a 100-kWh Tesla Model S battery pack (Table 4).

Table 4. Input Parameters for Battery Pack Weight Estimate

Battery pack size (Carbuzz, 2019)	100	kWh
Tesla Model S battery pack weight	619	kg
Tesla Model S battery pack dimensions	91 x 59 x 4.5	in
Specific energy of each cell	250	Wh/kg
Total number of battery modules	16	
Individual battery module weight(HSR Motors, 2019)	26.1	kg
Energy stored per module(HSR Motors, 2019)	5.2	kWh

The difference between the total module weight (418 kg) and the total cell weight (400 kg) gives the total weight of the busbars and cooling tubes (18 kg). The difference between the total pack weight (619 kg) and the total module weight (418 kg) gives the weight of the protective case (201 kg). Assuming that 50% of the busbar and cooling tube weight is from busbars and 50% is from cooling tubes, we calculate the per-unit weights of individual battery pack components (Table 6).

Table 5. Per-Unit Weight of Individual Battery Pack Components

Cooling tubes	0.09	kg/kWh
Busbars	0.09	kg/kWh
Battery cell	4	kg/kWh

To estimate the weight of our semi battery packs, we make the following assumptions:

- Weight of battery cells is scaled by battery pack capacity
- Weight of cooling tubes is scaled by battery pack capacity with a 5% weight reduction from design changes
- Weight of busbars is scaled by battery pack capacity and then reduced by 50% to account for higher voltage[13]
- Weight of the protective case is scaled with battery pack surface area (semi battery pack dimensions are 99x78x20 in, giving a surface area ratio of 2.14)

Table 6 shows the resulting battery pack component weights for a 797- and 1,062-kWh pack.

Table 6. Component Weights for a Semi Truck Battery Pack

	797-kWh pack	1062-kWh pack	
Cells	3,187	4,250	kg
Cooling tubes	67	89	kg
Busbars	35	47	kg
Protective case	127	202	kg
Total weight	**3,416**	**4,587**	**kg**

A final element of our weight calculation was to estimate the impact of light-weighting on total truck weight. The main light-weighting strategy that is suitable and currently available for Class 8 trucks is to convert components from a heavier material to a lighter material. There are many possibilities for such conversion--for example, converting cab sheet metal from steel to aluminum or lightweight steel, or converting aerodynamic roof hoods from aluminum to plastic. Another strategy for light-weighting is to combine different components to reduce the need for fasteners and other material interfaces. While light-weighting may not improve *individual* truck efficiency dramatically, it has driven a significant improvement in operational efficiency of *fleets*, where larger payload capacity per truck led to smaller fleet sizes needed to deliver the same quantity of payload (North American Council for Freight Efficiency, 2015).

[13] [consider dropping a footnote to explain why the weight of the busbars drop in half due to higher voltage - seems counterintuitive]

Although we focus on determining TCO from the truck owner's point of view, we also analyze additional benefits that could be realized if environmental externalities from diesel trucking can be monetized. In this paper the externalities we consider are costs of air pollution and greenhouse gas (GHG) emissions. Depending on existing markets or compensation mechanisms, such externalities may or may not be able to be included in the TCO. The degree to which truck electrification mitigates diesel trucking externalities depends on the fuel used for electricity generation. Here we primarily consider scenarios with electricity entirely powered by coal and gas, compared to 90% renewable energy (with the remaining 10% of electricity assumed to be powered by gas), as well as scenarios incorporating the current power mix of the United States and of California. These elements are summarized in Table 7.

Table 7. Input Parameters for Additional Benefits of Electrification

Unit air pollution cost components		
Air pollution damages from heavy diesel on-road vehicles (Goodkind et al., 2019)	$58	$billion/year
Air pollution damages from coal-based electricity generation (Goodkind et al., 2019)	$118	$billion/year
Air pollution damages from gas-based electricity generation (Goodkind et al., 2019)	$5	$billion/year
Coal-fired generation (EIA, 2020e)	1733	billion kWh/year
Gas-fired generation (EIA, 2020e)	1014	billion kWh/year
Fraction of on-road pollution contributed by Class 8 trucks[14]	56%	
Miles driven by Class 8 trucks (Bureau of Transportation Statistics, 2017)	164	billion miles/year
Unit GHG emissions cost components		
Diesel consumed by Class 8 trucks (Bureau of Transportation Statistics, 2017)	28,884	million gallons/year
Social cost of carbon (EPA, 2017)	$52	$/tonne CO2, 2019 dollars
Emissions intensity from coal-fired electricity (EIA, 2020c, 2020a)	210	lb CO2/million btu

[14] Estimated based on Goodkind et al. and California ARB[44]

Emissions intensity from gas-fired electricity (EPA Center for Corporate Climate eadership, 2018)	117	lb CO2/million btu
Emissions intensity of US power mix (Carnegie Mellon University, 2019)	943	lb CO2/MWh
Emissions intensity of CA power mix (EIA, 2019)	474	lb CO2/MWh
Coal plant heat rate (EIA, 2020d)	10,465	Btu/kWh
Gas plant heat rate (EIA, 2020d)	7,707	Btu/kWh
Methane leakage rate (Alvarez et al., 2018)	2.3%	% of US gas production
Total electricity losses across T&D system(EIA, 2020b) and in AC/DC power conversion[15]	14.5%	

3. Results

3.1 Total Cost of Ownership

Figure 4 shows the TCO comparison for both the 375-mile range and 500-mile range Class-8 electric truck relative to diesel. At the current international battery pack price of $135 per kilowatt-hour, a Class 8 truck electric truck with 375-mile range (300-mile range at 80% maximum DoD of battery) with a 797-kWh battery pack offers about 13% lower per mile TCO ($1.51/mi for electric compared to $1.73 for diesel) (Figure 2). This implies a net savings of about $200,000 over its lifetime for a less than 3% increase in the tractor weight given currently available light-weighting options.

[15] Industry interview

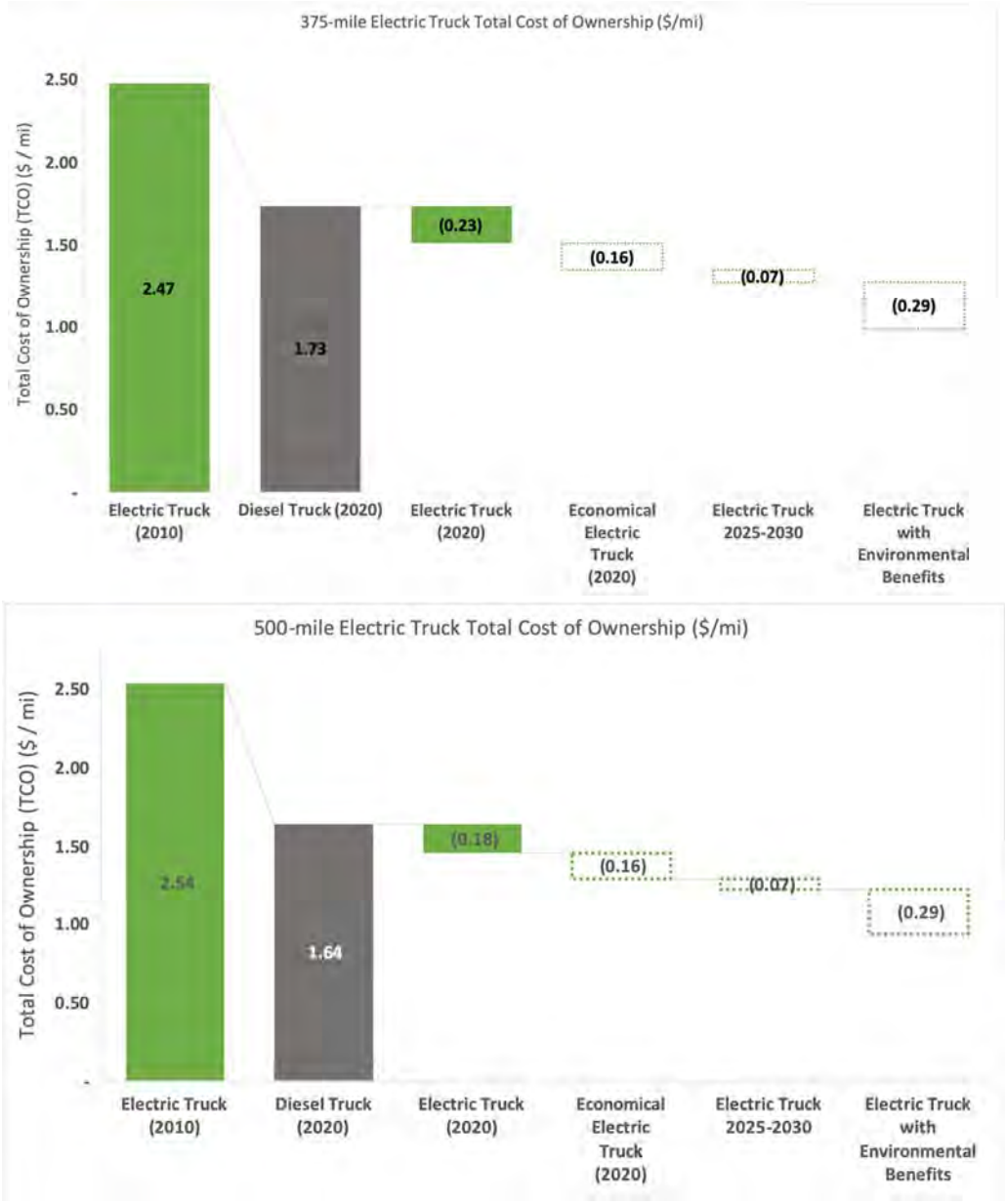


Figure 4 (Top) TCO comparison for 375-mile (797 kWh battery pack truck) operated 300 miles per day for 260 days per year. (**Bottom**) TCO comparison for 500-mile (1062 kWh battery pack truck) operated 400 miles per day for 260 days per year. The battery cost in 2020 is $135/kWh. The economical electric truck scenario assumes an aerodynamically better design which improves fuel economy coupled with a lower total charging cost ($0.1/kWh compared to $0.16 in base case). The electric truck in 2025-30 scenario tacks a decline in battery prices to $60 per kWh from the $135 per kWh on to the economical truck scenario. Lastly, this is combined with monetization of air pollution/GHG emissions benefits from avoided emissions, which further reduces the TCO.

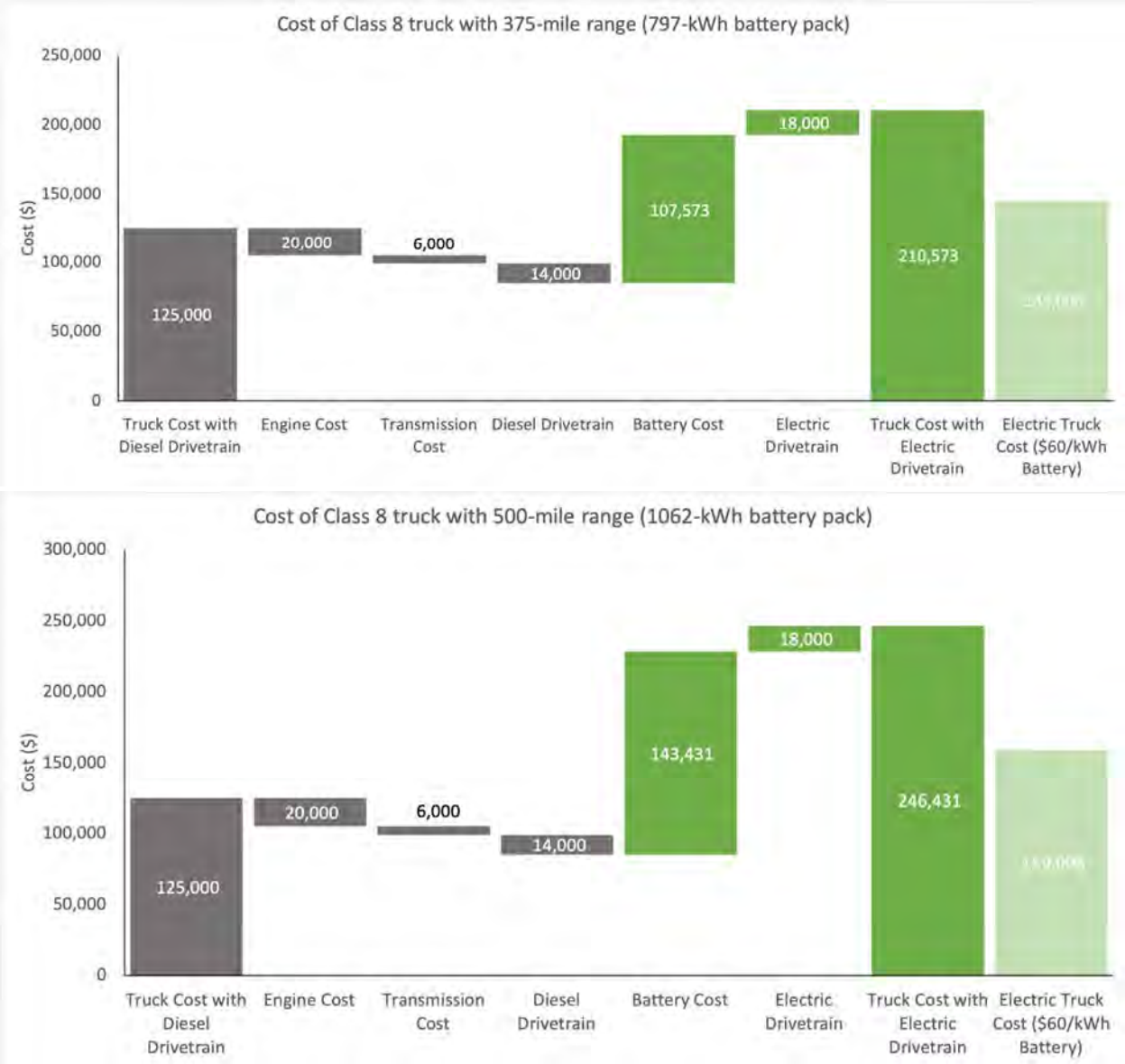


Figure 5 Capital cost of a Class 8 diesel truck compared with a Class 8 battery-electric truck with 375-mile range and 797-kWh battery (top) and 500-mile range and 1,062-kWh battery (bottom), with battery costs of $135/kWh (dark green) and $60/kWh (light green).

Figure 5 shows how we arrive at our estimate of the upfront cost of the electric truck. We begin with a diesel truck price of $125,000 and first subtracting out the cost of engine, transmission and drive train ($20,000, $6000 and $14000 respectively) which are not required in an electric truck. Next, we add to this the battery cost, which is simply the product of battery price per kWh and battery size ($107,753 and $143,341 for the 375-mile (797 kWh) and 500-mile (1062 kWh) trucks @ $135/kWh) and drive train cost ($18,000). This yields an estimated cost of $210,573 and $246,431 respectively for the 375- and 500-

mile trucks. These are respectively 69% and 97% greater relative to the upfront cost of the diesel truck.

For the 375-mile truck, the excess upfront cost translates to about $0.12 per mile (levelized). However, electric trucks save $0.11/mile on maintenance costs and $0.23/mile on fuel costs, yielding a net reduction of $0.23 per mile which explains the about 13% reduction relative to $1.73 per mile TCO of diesel, which can be seen in Figure 4. We assume other costs such as general operation costs such as driver wages, insurance, tire replacements, permits, and tolls are identical for diesel and EVs and ignore difference in end-of-life value.

We next describe our bottom-up weight estimates for battery and other drivetrain components based on the publicly available specifications for Volvo and Tesla for their Class 8 trucks. We break down truck weight for vehicles commercially available on the market based on Tesla's 375- and 500-mile range (797- and 1,062-kWh battery capacity) trucks with our conservative efficiency assumption of 2.1 kWh/mile (Tesla claims less than 2 kWh/mile). Figure 6 compares the weight of a Class 8 diesel truck and the weight of Class 8 electric trucks with 375-mile (top) and 500-mile (bottom) ranges. The figure assumes a packing fraction (ratio of cell weight to battery weight) of 0.88, which represents an improvement over the 100-kWh Tesla Model S packing fraction (0.65) owing to the lower surface-area-to-volume ratio of higher-capacity battery packs. The incremental truck weights are estimated by adding the weight of the battery and electric powertrain and subtracting the weight of the diesel powertrain components. The light green bar segments show the potential for reducing truck weight using lighter materials, such as aluminum, instead of steel for the truck body.

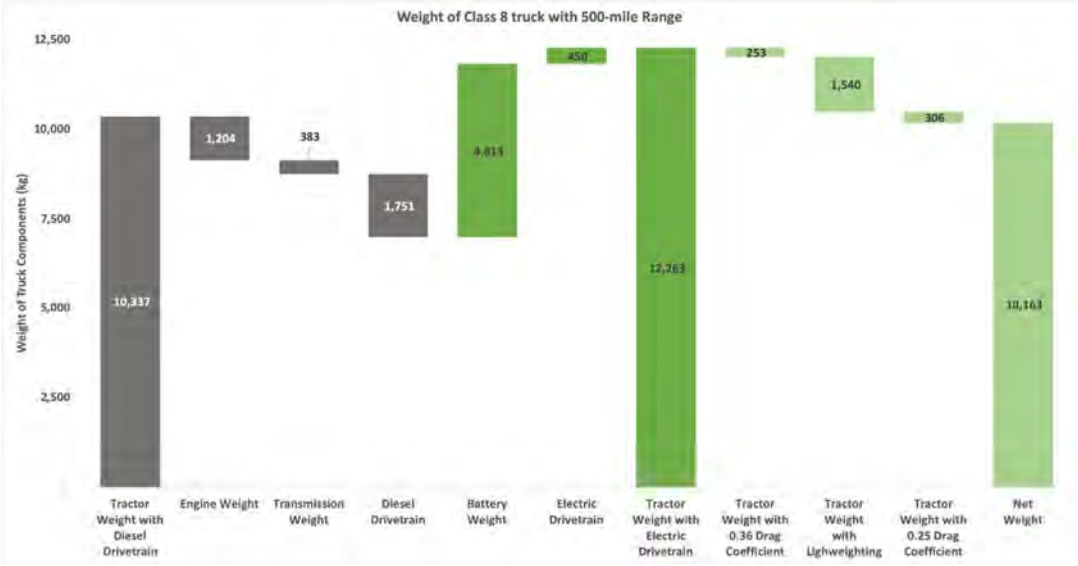


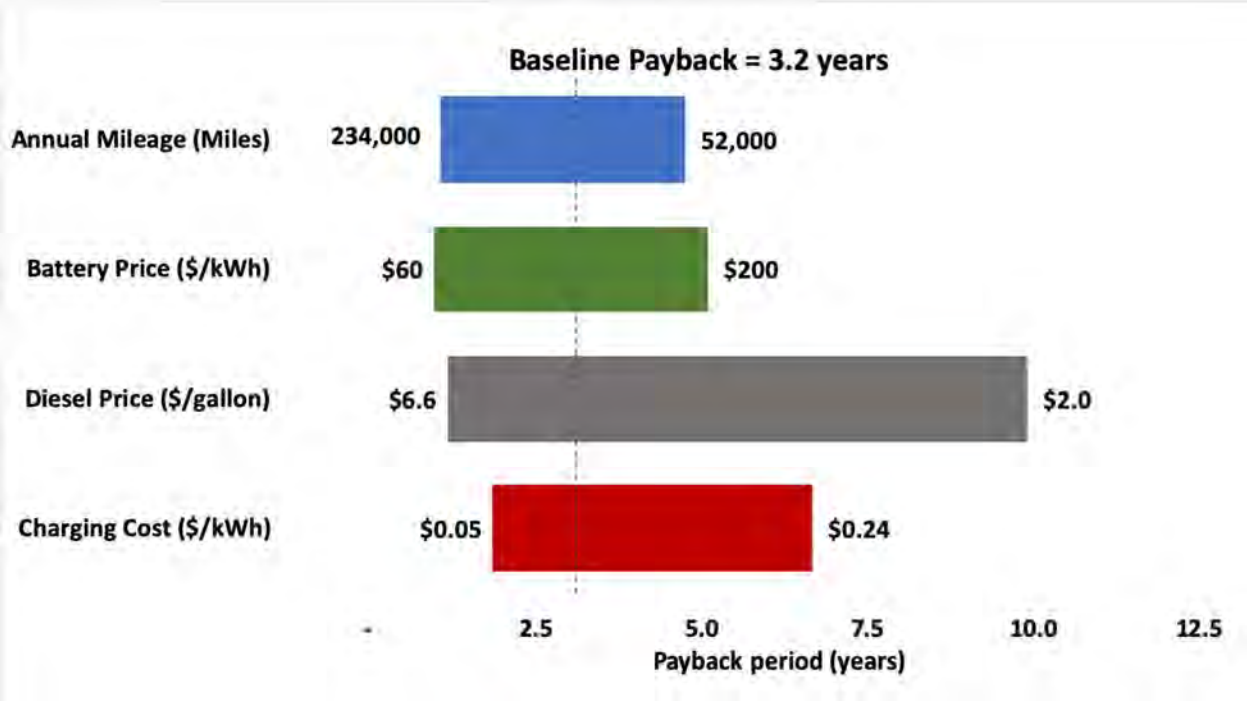
Figure 6. Weight of a Class 8 diesel truck compared with a Class 8 battery-electric truck with 375-mile range and 797-kWh battery (top) and 500-mile range and 1,062-kWh battery (bottom), cell specific energy of 250 Wh/kg and packing fraction of 0.88.

Our calculations suggest that the tractor of 375-mile range electric truck is about 3% (~ 300 kg) heavier relative to a diesel truck. However, adoption of even moderate light-weighting options can lead to an increase of 9% in total net payload capacity. For 500-mile electric trucks, the tractor is about 19% heavier relative to diesel tractor but which can be reduced to only 2% heavier by applying commercially available light weighting options resulting into only a minor reduction payload capacity.[16]

Electric trucks with a range up to 300 miles will not require any compromise of the payload capacity because lower weight of the electric powertrain compared to diesel compensates for the additional weight of the battery. Light-weighting (reduction up to 1.5 metric tonnes) and improved aerodynamics using commercially available technology can enable additional range up to 450 miles. Further, since most trucks reach their volume limit before reaching their weight limit, accepting a 5% weight penalty for reducing fuel cost significantly is likely to acceptable for most trucks; together this will allow for large enough batteries to reach ranges up to 600 miles (see ES2). Fast charging during 30-minute driver rest stop can add significant battery range (a 30-minute break is taken every 190 miles and 150 miles for a long haul and regional haul trucks respectively). For these reasons we believe that electric trucks will have sufficient range for most applications in the near future (see ES2 B).

[16] If trucks were to indeed achieve a fuel efficiency similar to those claimed by Tesla, then the battery size, weight, and cost could be about 20% lower than estimated here.

The mean baseline payback period for truck electrification for a 375-mile truck is 3.2 years (Figure 8). Figure 8 also shows the sensitivity of payback period to key parameters. When annual mileage and battery price are varied individually, payback period ranges between 1.0 and 5.1 years. When charging cost is varied individually, it ranges between 1.8 and 6.7 years. When diesel price is varied individually, it ranges between 1.2 and 9.9 years The Discussion section addresses variation in charging cost further.



*Battery price range $200 - $60

Figure 8. Sensitivity of the electrification payback period, not including any additional environmental benefits, to different parameters: each parameter is varied individually while the other parameters are held at their baseline values listed in Table 6. Baseline values are 78,000 miles/year driven, $135/kWh battery cost, $3.3/gal diesel, and $0.16/kWh charging cost (which includes both the electricity cost and the levelized cost of charger per kWh of electricity delivered). Sensitivity range for charging cost is based on Phadke et al. 2019; for diesel is based on 50% and 200% of baseline; for battery price is based on 2017 prices and projected 2020-26 prices;

Indeed, electricity emissions intensity (in terms of both air pollution and GHGs) determines the level of net environmental benefits for electric trucks relative to diesel (see Figure 9).

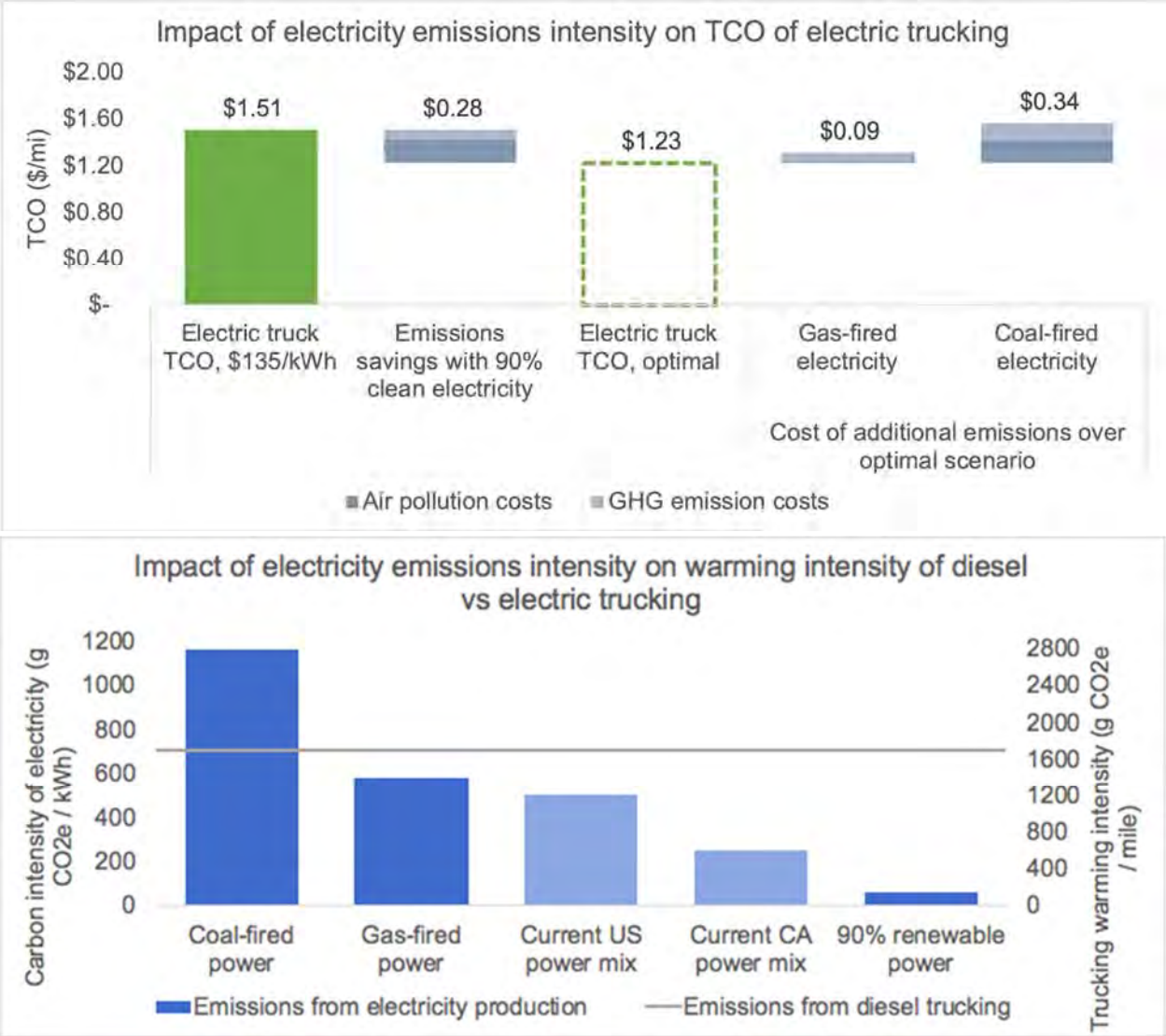


Figure 9. (Top) Impact of electricity emissions intensity (from 90% clean electricity, gas-fired electricity, and coal-fired electricity) on 375-mile electric truck TCO, assuming air pollution and GHG emissions costs can be monetized. (Bottom) Comparison of warming intensity of trucking for diesel trucking and electric trucking powered by electricity from coal, gas, and 90% renewable energy, and by the current power mix in the US and in California.

While savings on air pollution and GHGs from electrification are $0.28/mi in a scenario where electricity sources are 90% clean, savings drop to $0.20/mi when electricity comes from gas, and savings become negative (costs rise) by $0.05/mi when electricity comes from coal. In terms of global warming, diesel trucking contributes more warming (in terms of g CO2e/mile) than electrified trucking powered by either gas or 90% clean energy. However, electric trucks powered by gas-fired electricity only save 18% of GHG emissions over diesel

trucking, and electric trucking powered by coal produces 64% more GHG emissions than diesel trucking on a per-mile basis.

4. Discussion

The comparison of diesel and electric Class 8 long-haul trucks based both on a bottom-up estimation and market-data shows the following. A Class 8 truck electric truck with 375-mile maximum range with a daily average utilization of 300 miles offers about 13% lower per mile TCO and a 3- to 4-year payback for a net savings of about $200,000 over its lifetime, all for about a 3% reduction in payload capacity. Even this reduction in payload capacity could be avoided cost-effectively through light-weighting, and is not a major concern beyond the small fraction of operators which consistently use the trucks maximum payload limit. Based on this our primary conclusion is that that replacing long-haul diesel trucks with electric trucks is both technically feasible and economically viable.

A key lesson is that a low cost of fast-charging (both the amortized cost of charging infrastructure and cost of electricity combined) is central to the economic case for truck electrification, and therefore, getting the charging cost right is critical. As detailed in Phadke et al. 2019 and illustrated in Figure 10, clean, low-cost generation is become abundant across several hours of the day. For instance, most hours of the year in both ERCOT and CAISO have low wholesale electricity prices (see Figure 10). Dynamic electricity tariffs are necessary for the trucking industry to take full advantage of those prices. While static tariffs have fixed price schedules and non-peak-coincident demand charges, dynamic tariffs track wholesale electricity prices, and more importantly, have demand charges coincident with system peak demand. Dynamic tariffs align pricing with the real-time state of the grid and incentivize trucks to charge during low-priced times when the grid is unconstrained. Static tariffs—particularly non-peak-coincident demand charges—can unnecessarily impede truck charging by imposing a high per-kW charge even when charging happens when the grid is unconstrained and generation prices are low.

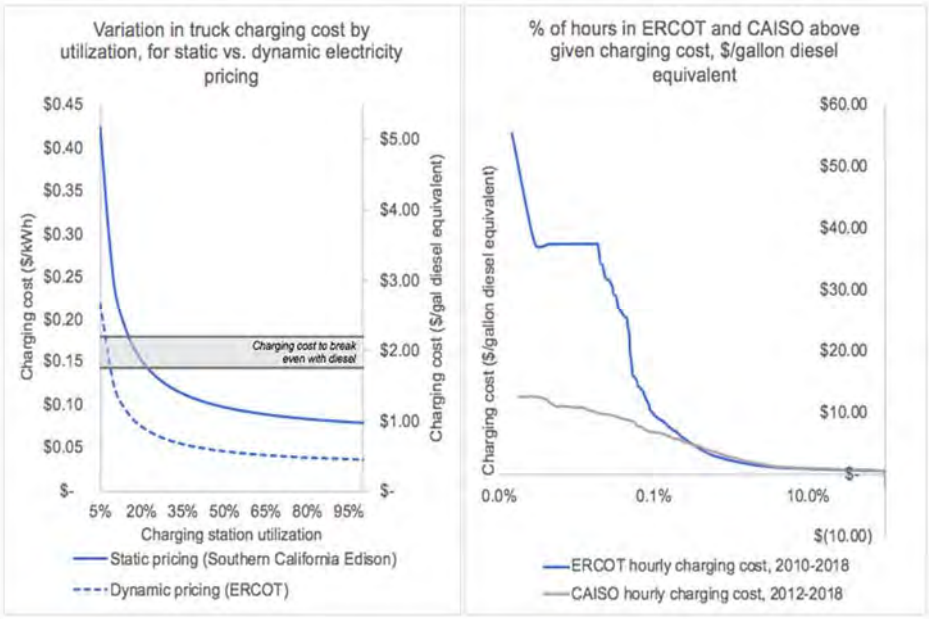


Figure 10. ***Excerpt from Phadke et al. (2019)*** Variation in truck charging cost by utilization, for static vs. dynamic, system-reflective electricity pricing (left). Proportion of hours in ERCOT (2010–2018) and CAISO (2012–2018) above given charging cost (right). Note: Diesel breakeven range is based on $3.30/gal diesel, battery costs are between $150/kWh (top of range) and $100/kWh (bottom of range), and truck efficiency is assumed to be 5.9 mi/gal (diesel) or 2.1 kWh/mi (electric).

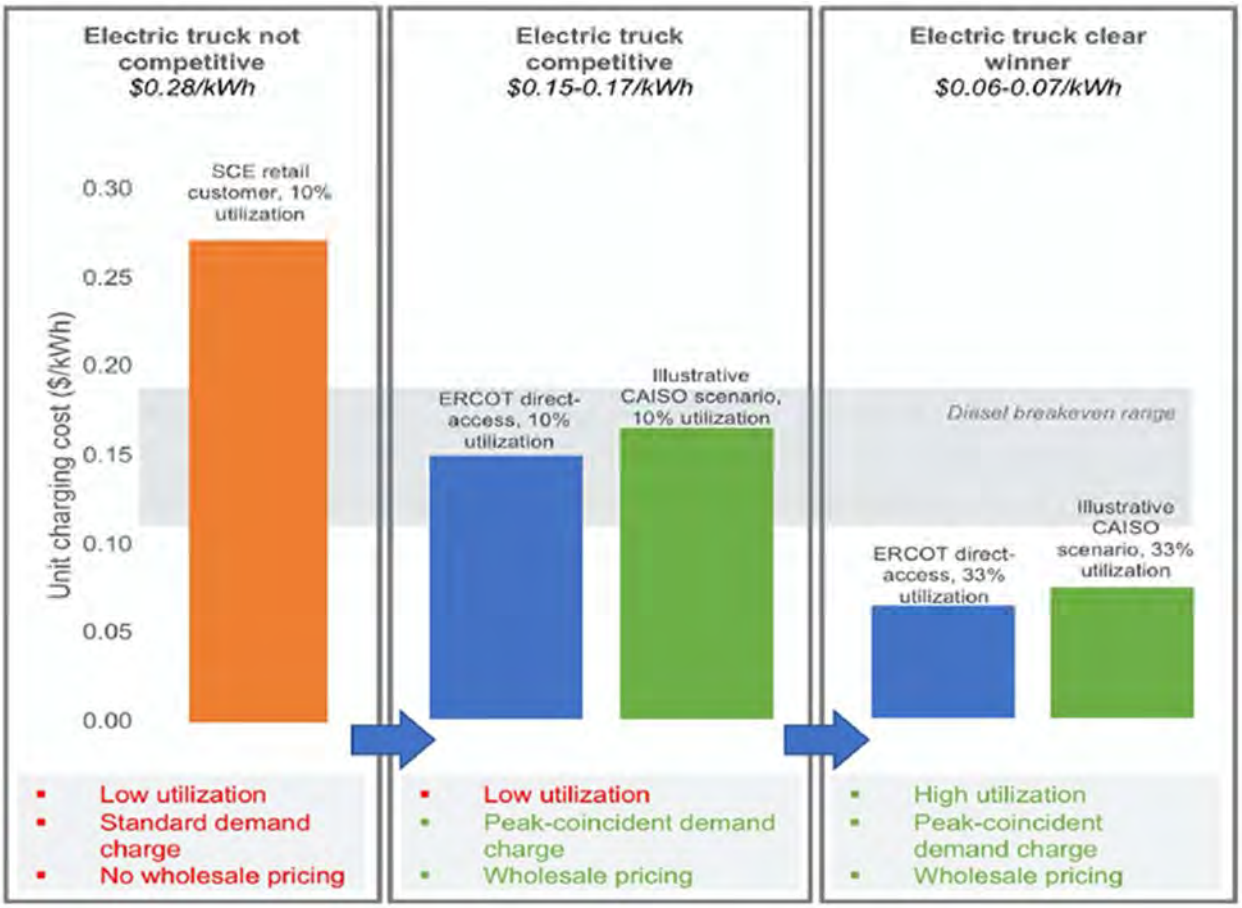


Figure 11: ***Excerpt from Phadke et al. 2019*** Rationale electricity tariffs and improved charging infrastructure utilization can significantly improve the economics of electric trucks

We held diesel and electricity prices fixed in this analysis. While modest real increases in diesel prices are being projected (EIA, 2019), we assume no increase on account of high rates of vehicle electrification—the scenario we implicitly address in this paper—could reduce petroleum demand enough to decrease diesel prices. For similar reasons, we do not assume escalating electricity prices. Given uncertainties surrounding grid decarbonization scenarios, falling renewables prices, electrification rates, and electricity policy, we do not attempt to predict changes in electricity prices over time and instead compare electricity to diesel on today's terms.

Environmentally, the benefits of truck electrification can be substantial, but depend on the emissions intensity of electricity. The only scenario in which truck electrification has negative incremental environmental benefits relative to diesel is when the electricity is entirely from coal-based generation while, and not surprisingly, maximum benefits accrue

when electricity is exclusively from clean renewables. Gas-fired power, while substantially less emitting than coal and diesel in terms of air pollution, is only marginally better than diesel trucking in terms of GHG emissions when accounting for methane leakage.

The investment trend in the US electricity sector is away from coal and towards increasing renewable energy and natural gas. From 2008-2018, 45% of new capacity additions were gas, and 44% were wind or solar. Only 7% of new capacity in this period was coal, and no new coal capacity has been added since 2015. Looking forward, 50% of capacity under construction is gas, and 44% is wind or solar; similar ratios hold for permitted capacity. (Wind and solar account for over 60% of capacity in earlier stages of development, with gas only 17-26%.)[32] Furthermore, 10 states, as well as Washington, D.C., and Puerto Rico, have 100% clean energy or renewable energy targets.[27] As such, new trucking load will likely be met with increasing investment in gas and renewables, meaning that long-run marginal emissions from electric trucking are expected to be less than that of diesel trucking.

In sum, today there is reason for optimism that long-haul truck electrification can be achieved at a TCO lower than diesel truck TCO without compromising on payload capacity. Future technical research needs to focus on estimating charging infrastructure needs to support an electrified trucking network and developing strategies for charging under different given fleet performance criteria and grid conditions.

An appropriate policy ecosystem is required to stimulate and facilitate the transition from diesel to electric long-haul trucking. As is the case with almost any clean technology, higher upfront costs (for both vehicles and charging infrastructure), due to lack of scale economies and market uncertainty, are greater at the early stages of adoption and are a major market barrier. For instance, notwithstanding the 13% lower TCO of electric trucks (for a 375-mile range truck with a 797-kWh battery pack), they are costlier upfront by 75% upfront, which is major barrier. As battery costs decline, charging related costs are beginning to loom larger. Whereas a decade ago, when battery prices were close $1000/kWh, charging-related cost would have accounted for about 15% to 18% of the TCO of heavy-duty trucks, today they account for 25% to 30%. Recall Figure ES3 which shows how the utilization of charge infrastructure determines the total cost of charging (the sum of cost of electricity and levelized cost of infrastructure) and early stage of adoption will necessarily be characterized by low utilization of charging infrastructure.

Realizing the full economic potential of electric trucks requires surviving a period of infancy of this industry marked by low demand for vehicles and charging, and consequently, higher cost of new vehicle manufacturing and slower return on charging infrastructure. Faced with such barriers, absent public intervention, private investments in electric truck will occur at a level lower than is socially optimal. While this is characteristic of any infant industry, given the importance of addressing pollution from trucking, without strong policy support the coordinated and large-scale investments in vehicle technologies and fuel infrastructure will not be forthcoming on the scale needed to harness the true potential of battery electric trucks. Binding targets for vehicle sales supported by targeted incentives that are indexed both to international battery prices and cumulative sales can help in this regard. There is also a need to rationalize electricity tariffs so that they send the right price signals for truck charging without imposing undue burden on the rest of the system.

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REMOVAL ACTION WORKPLAN
(RAW) IMPLEMENTATION REPORT

CalEnergy Geothermal Facilities
Calipatria, California

November 10, 2011

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This Removal Action Workplan (RAW) Implementation Report for CalEnergy Geothermal Facilities, Calipatria, California dated November 10, 2011, has been prepared under the supervision of California state-certified Professional Engineer.

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1.0 INTRODUCTION

Iris Environmental, on behalf of CalEnergy Operating Corporation (CalEnergy), has prepared this Removal Action Workplan (RAW) Implementation Report to document soil removal activities performed under the direction of the State of California, Environmental Protection Agency (Cal/EPA) and Department of Toxic Substances Control (DTSC). This work was done as part of the Corrective Action Consent Agreement (CACA), Docket SRPD GIC851471 issued by DTSC on March 7, 2007 and the Removal Action Workplan (RAW) dated December 16, 2010, and approved by DTSC on February 1, 2011 (Iris Environmental 2010 and Cal/EPA 2011).

In 2007 and 2008, five Preliminary Endangerment Assessment (PEA) investigations were conducted at the CalEnergy facilities in Calipatria, California (Site). The PEA investigations were conducted to evaluate the possible exposure of on-site and off-site human and ecological populations to arsenic and other metals present at the Site at areas of concern (AOCs) identified in the CACA as a result of previous activities conducted at the CalEnergy facilities. During energy production, solids from the extracted geothermal fluids accumulate as scale in facility equipment and pipes; as sediments in brine ponds; and as filter cake removed from the clarifiers. During maintenance operations (high pressure water washing [*i.e.*, hydroblasting] of the piping, removal of sediments from the brine ponds, and the removal of filter cake from the clarifiers), these solid scale/sediment/cake materials were released to on-site surface soils in the vicinity of these maintenance operations. These solid materials are known to contain arsenic and other metals. Other activities conducted at the Site included storage of facility equipment and piping. The results of these investigations were reported to the DTSC on December 23, 2009 (Iris Environmental 2009a, b, c, d, and e). Excerpts from the PEA investigation reports are included in Appendices A through E.

On December 30, 2009, the DTSC issued PEA approval letters (Cal/EPA 2009a, b, c, d and e) and agreed with the recommendations in the PEA reports to remove impacted soil. The RAW, which included the five PEA facilities, was submitted to the DTSC and made available for public comment on December 16, 2010. A notice of the 30-day public comment period was published in the Imperial Valley Press and Adelante Valle (Spanish language) newspapers on December 16, 2010. In addition, interested parties were identified by the DTSC and a Fact Sheet was mailed to provide notice of the removal action and public comment period. The draft RAW, Notice of Determination, Negative Declaration, and California Environmental Quality Act (CEQA) Initial Study were available to the public during the comment period from December 16, 2010 to January 17, 2011, at the Meyer Memorial Library in Calipatria, and at the DTSC office in Cypress, California, and DTSC's EnviroStor website. The RAW was approved on February 1, 2011 (Cal/EPA 2011).

Between February 9, 2011 and June 23, 2011, removal activities and confirmation sampling were conducted at the Site. During this time and until August 8, 2011, the areas excavated were re-graded, and the removed soil was profiled and transported off-site for proper disposal. Iris Environmental's final inspection of the Site restoration activities was completed on August 9, 2011.

This RAW Implementation Report includes a summary of the approval of the RAW and cleanup goals, a description of the removal implementation, and the results of confirmation sampling. During the implementation of the RAW activities, the facilities continued their normal operations, generating electricity from geothermal resources.

1.1 Purpose of the RAW

The purpose of the RAW was to comply with the requirements of the CACA dated March 7, 2007 and the five PEA approval letters dated December 30, 2009. During the implementation of the RAW, the appropriate cleanup activities were conducted to address the arsenic- and lead-impacted areas identified during the PEA investigations. With this successful completion of the RAW, the requirements of the CACA, as it pertains to the impacted areas, are satisfied.

1.2 Removal Action Objective and Cleanup Goals

As presented in the RAW, the remedial action objective (RAO) was developed and several remedial alternatives were evaluated (Iris Environmental 2010). Following are the RAO, cleanup goals, and remedial alternatives that were evaluated.

The RAO is designed to protect human health and the environment from exposures to hazardous substances and to include characteristics of the chemicals of concern, potential exposure pathways, and cleanup goals. The results of the human health risk evaluation showed that the primary threat to human health under a commercial/industrial scenario would come from the pathways for dermal contact, ingestion, and to a much lesser extent, inhalation of soil. The RAO for this Site was to reduce the risk of human exposure to arsenic and lead at the Site. This objective was achievable by either reducing concentrations or reducing the potential for human exposure, or both. The objective was achieved by the remedial measures conducted that support the continued use of the property. The RAO reflects a preference for permanent solutions, incorporating approaches, where feasible and appropriate, which will reliably reduce toxicity, mobility, or volume of contaminants.

The RAO for the Site was developed to be protective of human health and the environment and was used to select an appropriate remedy and to prepare the RAW. The identified arsenic- and lead-impacted soil at and in the vicinity of the AOCs at the Site have been remediated with the RAO in mind. During the PEA investigations, an arsenic background study was conducted. The DTSC-approved Site-specific background arsenic concentration was 26 milligrams per kilogram (mg/kg) and this concentration for arsenic was accepted as the cleanup goal (Cal/EPA 2007c). The lead-impacted soil was remediated to the industrial California Human Health Screening Level (CHHSL, Cal/EPA 2005) of 320 mg/kg.

1.3 Selection of Remedial Alternative

Based on the results of the PEA investigations identifying the nature and extent of the impacted soil, four remedial alternatives were identified, evaluated based on three criteria (effectiveness, implementability, and cost), and the alternative with the highest rating points was selected (Iris Environmental 2010). The remedial alternatives included no action, capping, stabilization, and excavation. The scraping/excavation alternative was selected as the most time- and cost-feasible, to meet the RAO and cleanup goals.

The remedy chosen was scraping/excavation, which consisted of scraping or excavating the impacted soil and stockpiling for profiling prior to disposal. Excavation prevents migration of the contaminants, and long-term exposures to the impacted soil. Excavation involves the use of standard or special construction equipment that is adapted to minimize disturbance to the Site and to minimize secondary migration. Upon completion of the excavation activities, the excavated areas were graded to match the existing ground surface using soil at the Site.

The remedy included securing excavated soil during profiling prior to disposal at an off-site regulated disposal unit. The stockpiled soil was sampled according to the profiling requirements of CalEnergy's disposal facility (Desert Valley Company [DVC]), approximately 25 miles from the Site. DVC is a California Class II landfill facility permitted through the County of Imperial Public Health Department. The permit allows DVC to accept up to 750 tons per day of non-hazardous geothermal materials, including geothermal drilling muds and cuttings, geothermal filter cake, soils contaminated with geothermal material, and incidental plastic sheeting/liners or materials. The most recent permit renewal was dated January 1, 2011, and is included in Appendix F. Based on the analytical results, most of the excavated soil was non-hazardous and suitable for DVC. Soil not suitable for DVC was transported to Waste Management Incorporated Kettleman Hills Landfill in Kettleman City, California (Kettleman).

1.4 CEQA Requirements

CEQA was signed into law in 1970 (Public Resources Code, Section 21000 et seq.). Per CEQA implementation guidelines contained in Title 14, Code of California Regulations, Section 15000 et seq., a lead agency is required to conduct an Initial Study to assess if a project may have significant effect on the environment. All phases of project planning, implementation, and operation must be considered in the Initial Study for the project. For CalEnergy, DTSC is the lead agency. The Initial Study for implementing the RAW at the CalEnergy geothermal power facilities in Calipatria, California consisted of:

- Providing information to use as the basis for deciding whether to prepare an Environmental Impact Report (EIR) or a Negative Declaration;
- Enabling the DTSC to modify a project, thus mitigating adverse impacts before an EIR is prepared, thereby enabling the project to qualify for a Negative Declaration;
- Facilitating environmental assessment early in the design of a project (if applicable);
- Providing documentation of the factual basis for the finding in a Negative Declaration that a project will not have a significant effect on the environment.

The Initial Study process entails the use of a standardized Initial Study format containing a listing of various environmental resource areas which must be analyzed for potential impacts. The *Workbook for Conducting Initial Studies Under the California Environmental Quality Act* was used for this project (Cal/EPA 1996).

An Initial Study was prepared that described the existing conditions at Leathers, Central Services, Elmore, Vulcan/Hoch, and Region 1 (Units 1 and 2, and Units 3 and 4), and responded to the questions in each resource area. The Initial Study concluded that the implementation of

the RAW would not have a significant effect on the environment; therefore, a Negative Declaration was prepared and filed with the California State Clearinghouse.

1.4.1 Availability of Documents to the Public

Title 14, California Code of Regulations (CCR) Sections 15201 and 15202 of the 1998 CEQA Guidelines Revisions provide:

- That each public agency should include in its CEQA procedures making environmental information available in electronic format on the Internet, whenever possible.
- To the extent the public agency maintaining a website, notice of all CEQA public hearings should be made available in electronic format on that website.

Project related CEQA documents were posted online at http://www.dtsc.ca.gov and available at the Meyer Memorial Library in Calipatria, California as of December 16, 2010. A public notice was published in the Imperial Valley Press and Adelante Valle (Spanish language) newspapers on December 16, 2010, and a public notice was mailed to interested parties on December 15, 2010.

1.4.2 Public Comment Component of CEQA

Title 14, CCR Section 15201 of the CEQA Guidelines declares the importance of public participation as an element of the CEQA process. It requires each agency to include provisions in its CEQA procedures for wide public involvement, formal or informal, consistent with its existing activities and procedures, in order to receive and evaluate public reactions to environmental issues related to the agency's activities. As part of DTSC's approval for a non-exempt CEQA RAW project, a public comment period was held between December 16, 2010 and January 17, 2011. The Draft RAW, Initial Study, and Negative Declaration was available at the Meyer Memorial Library in Calipatria California (local to the project site), at DTSC's offices in Cypress, California, and on-line at DTSC's EnviroStor. No comments were received during the public comment period. For this project, DTSC chose to not hold a public hearing due to no comments/interest from the community.

1.5 Public Participation Outreach

The DTSC Public Participation Policy and Procedures Manual is the primary reference for preparing, implementing, and monitoring all public participation activities required under DTSC's site mitigation and hazardous waste management processes. After reviewing the RAW, the DTSC Public Outreach Specialist developed a public participation strategy to ensure that the local community is informed of the project. The strategy included publishing a Public Notice in local papers and mailing a Fact Sheet notifying the public that the RAW is available for review prior to final approval of the RAW. This project is a non-exempt CEQA project; therefore, DTSC announced opportunities for public review and comment on the RAW related documents including the CEQA Initial Study by circulating the Fact Sheet in the community and placing a Public Notice in two local newspapers (including a newspaper in Spanish). The public had 30 days (between December 16, 2010 and January 17, 2011) to review and provide comments on

the proposed cleanup activities. No comments were received and the RAW was approved on February 1, 2011 (Cal/EPA 2011).

1.6 Report Organization

The RAW Implementation Report is organized in the following sections:

- Section 1 – Introduction: An introduction to the purpose and scope of work of the RAW, including complying with the CACA, and a statement of the objective, the RAO, CEQA documentation, and public outreach program.

- Section 2 - Site Information: A description of the CalEnergy facilities and the PEA work completed at each facility. The PEA activities included reviewing Site history, conducting soil investigations, conducting a background study for arsenic, evaluating ecological and human health concerns, and identifying areas of soil impacted above the cleanup goals.

- Section 3 – Removal Action Plan: A general description of the tasks implemented for the remedy, including fieldwork, mobilization, health and safety plan, confirmation sampling, waste disposal, and Site restoration activities.

- Section 4 – RAW implementation: For each facility, a description of the work conducted at each AOC, including the confirmation sampling program and waste disposal.

- Section 5 – Conclusion: A statement that the RAO of the project has been met and a request for no further action.

- Section 6 – References: A list of references used herein.

2.0 SITE INFORMATION

The CalEnergy facilities in Calipatria, California are part of the 4,470-acre Salton Sea Known Geothermal Resource Area. The Site is located in Imperial County, within the Imperial Valley, south and southeast of the Salton Sea (Figure 1). The nearest towns are Calipatria (to the east), Niland (to the northeast), Brawley (to the southeast), and Westmorland (to the south). Specific information for the Leathers facility is included in Appendix A, Central Services in Appendix B, Elmore in Appendix C, Vulcan/Hoch in Appendix D, and Region 1 (Units 1 and 2, Units 3 and 4, and Unit 5) in Appendix E. Each appendix includes a table of Site information (Site identification, address, other Site names, United States Environmental Protection Agency (USEPA) Identification Number, Imperial County Assessor's Map), tables summarizing the results of the PEA investigation, and figures of the PEA investigation soil results. This information was also presented in the RAW (Iris Environmental 2010).

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2.1 CalEnergy Facilities

The location of the Site is shown on Figure 1. The five facilities identified in the CACA are shown on Figure 2 and are:

- Leathers: Leathers Geothermal Power Plant (Leathers) is the plant furthest to the east within Region 3. This facility is identified in Paragraph 1.4 (f) and Paragraph 5.4 of the CACA.

- Central Services: Central Services Facility is located within Region 3. This facility is identified in Paragraph 1.4 (g) and Paragraph 5.5 of the CACA.

- Elmore: Elmore Geothermal Power Plant (Elmore) is located within Region 3. This facility is identified in Paragraph 1.4 (e) and Paragraph 5.3 of the CACA.

- Vulcan/Hoch: The CACA identifies Region 2 which includes the Vulcan Geothermal Power Plant (Vulcan) and Del Ranch Geothermal Power Plant, also known as A.W. Hoch (Hoch). These facilities are identified in Paragraph 1.4 (c) and (d) and Paragraph 5.2 of the CACA.

- Region 1: Region 1 includes the Salton Sea Geothermal Power Plant Units 1 through 5, referred to as Units 1 and 2, Units 3 and 4, and Unit 5. These facilities are identified in Paragraph 1.4 (a) and (b) and Paragraph 5.1 of the CACA.

2.1 Site Characteristics

The CalEnergy facilities in the Imperial Valley are part of the 4,470-acre Salton Sea Known Geothermal Resource Area. The region is used mostly for agriculture and geothermal power plant production.

2.1.1 Topography

The CalEnergy facilities are located in Imperial County in Calipatria, California, south and southeast of the Salton Sea (Figure 1). This region of the Imperial Valley, a flat, featureless playa floor, is almost entirely below sea level. The elevation at the Site and the surrounding land is at approximately 200 feet below mean sea level. The topography in the vicinity of the Site is relatively flat. Database summary reports generated by Environmental Data Resource (EDR) as part of the PEA investigation (see Appendix A of the PEA Investigation reports, Iris Environmental 2009a, b, c, d, and e) indicated that the Site and the surrounding vicinity are within a 100-year flood zone.

2.1.2 Meterology

Typical of desert climates, annual precipitation within Imperial Valley is highly variable, but mean annual precipitation is between 3 to 5 inches per year (Hely *et al.* 1964). Temperatures range between 41 degrees Fahrenheit (^{o}F) to well above 105^{o}F during the summer months. Total net infiltration is expected to be insignificant/very low. Indeed, deserts are part of a wider classification of regions that have a moisture deficit on an annual-average basis.

2.1.3 Regional Geology and Hydrogeology

The Site is located within the Imperial Valley, which is approximately 190 miles southeast of Los Angeles. The Imperial Valley is part of the Salton Trough which extends from San Gorgonio Pass southeast to the Mexican border, including the Gulf of California and beyond the tip of the Baja California Peninsula. The Salton Trough is a faulted basin with bordering mountain slopes defined by fault planes of members of the San Andreas Fault system. The surrounding mountains are largely faulted blocks of the Southern California batholith granitic rocks of Mesozoic age, overlain by fragments of an earlier metamorphic complex of various ages dating back to Precambrian time. The valley is also laced with major members of the San Andreas Fault system that experience minor to moderate earthquakes. At the bottom of the valley lies the Salton Sea, the largest man-made (during a 1905 incident) lake in California. The lake does not have an outlet to the ocean, because the valley lies below sea level (Singer 1998).

The Imperial County general plan indicates that the Site is in an area within the 100 year flood plain. The valley basin contains sedimentary fills of sands and gravel up to 15,000 feet in thickness that accumulated during the Cenozoic time. Most of these sediments are only partially consolidated into sandstones and conglomerates. The fill increases in thickness from north to south. The layers slope gently down-valley and contain several important aquifers, such as the Coachella Aquifer. The aquifers of the valley are zones of relatively coarse-grained alluvial materials deposited during the cool, wet years of Pleistocene time. These sediments are the products of intensive erosion of the surrounding mountains during that time. The erosional debris was brought to the valley floor by the various stream channels that drained the San Bernardino, San Jacinto, and Santa Rosa Mountains (Singer 1998).

The Coachella aquifer is shaped as a cone with the apex at San Gorgonio Pass and the base merging in to the Salton Sink. This elongated structure contains a thick sedimentary sequence with granitic bedrock defining its sides. The sediments lap against the granitic margins, sloping to the central axis from both sides, then thickens and becomes more deeply buried as the trough opens to the south (Singer 1998).

Water quality varies extensively throughout the Imperial Valley groundwater basin. Department of Health Services data from public supply wells show an average total dissolved solid (TDS) concentration of 712 milligrams per liter (mg/l), with a range from 662 to 817 mg/l. In general, TDS ranges from 498 to 7,280 mg/l, which makes groundwater beneath the basin unusable for domestic and irrigation purposes without treatment. Approximately 7,000 acre-feet per year of groundwater is estimated to recharge the basin from the highly polluted New River and Alamo River which drain the Mexicali Valley (DWR 2003).

2.1.4 Current Site Operations

At the CalEnergy Calipatria facilities, geothermal energy is used to generate electrical power output by bringing superheated brine from the geothermal resource area to the surface, flashing a portion to steam, and injecting the spent brine and condensate back into the geothermal reservoir. The Salton Sea Known Geothermal Resource Area is a source of indigenous energy for California that also has unique natural characteristics described below.

The generation of electricity using geothermal resources begins with brine production wells and ends with replenishment of the geothermal resource through brine injection wells. The brine production wells tap into the geothermal resource approximately 5,200 to 9,500 feet below the surface of the Earth. Geothermal fluids (also referred to as brine) in the Salton Sea Known Geothermal Resource Area are high temperature, high pressure fluids that contain a high concentration of dissolved solids (approximately 250,000 to 300,000 parts per million [ppm] of solids with primarily 24 percent chlorine salt compounds). The geothermal fluid is extracted through production wells and directed, via piping, to the plants. Throughout CalEnergy geothermal facilities, approximately 72,000 feet of pipe is used to transport the brine. At the facilities, the geothermal liquids brought to the surface are flashed to steam in a controlled manner. This steam or energy from the steam, depending on the design of the facility, drives the turbine generators to produce electricity.

Once the brine has been depleted of energy (*i.e.*, heat) through the electricity generation process, it is processed to remove solids (i.e. filtercake) and reinjected back into the geothermal resource. Injection permits from the Department of Oil, Gas, and Geothermal Resources require the injection of 75 percent of the fluids drawn from the geothermal resource to ensure protection of the resource. Because the geothermal brine contains a high concentration of dissolved solids, pressure and/or temperature decreases prompt a precipitation of the solid material from the liquids. To minimize degradation of the injection wells, the majority of the insoluble solids are removed from the brine prior to injection into the geothermal resource. The facilities use a patented technology to allow for controlled precipitation of solids within the geothermal process.

Typical activities at the CalEnergy geothermal facilities include generation of filter cake during preparation of brine for injection, storage of brine in brine ponds, and maintenance and storage of piping and equipment. Following is a description of geocrete, and the activities and AOCs identified in the CACA.

<u>Filter Cake</u>
The controlled precipitation of solids from the brine before injecting the brine back into the geothermal resource takes place in large clarifiers that concentrate the solids and remove them from the geothermal liquids. These liquids, essentially free of suspended solids, can then be injected into the geothermal reservoir. It is necessary to remove the insoluble solids to prevent plugging of the injection wells. The removed concentrated solids are transferred to filter presses, where additional liquid is separated out. At the Leathers and Elmore facilities, the filter cake is then conveyed to the filter cake bays. The bays are constructed of a concrete floor, walls on three sides, a roof, and a concrete loading area. In 2007, doors were added to the fourth side of the bay to minimize the release of filter cake from the bay. At the Unit 5 and Vulcan facilities, filter cake is transferred from the filter presses and directly loaded into end dump trailers. A

rigorous sampling program of the filter cake is maintained. Based on analytical results produced by an Environmental Laboratory Accreditation Program (ELAP) certified laboratory, the filter cake is statistically non-hazardous, and is typically disposed of at a Class II landfill facility. In addition, a "Filter Cake Dispersion Mitigation Plan" has been developed and is in practice for the filter cake operations at all CalEnergy Imperial Valley facilities.

Geocrete

At several locations throughout the CalEnergy facilities, specifically Hoch and Unit 1, geocrete was placed in the subsurface. Geocrete is a concrete stabilized filtercake material containing arsenic made into blocks and intended to be used as a substitute for concrete. The State of California, Regional Water Quality Control Board – Colorado River Basin (RWQCB) authorized its use at the Site in 1985 (RWQCB 1985). Because the geocrete is typically buried beneath asphalt, the extent of geocrete cannot be determined visually. The presence of the geocrete restricted soil sampling at several locations during the PEA investigations. Per DTSC approval, throughout the project, areas of suspect geocrete were not to be disturbed.

Brine Water Impoundments

The brine ponds function to retain geothermal materials and cooling tower blow-down during emergency situations, maintenance operations, and spills, and are regulated by the RWQCB Waste Discharge Requirements (WDRs). These units are elevated above ground and are lined with either concrete or a membrane underlain by compacted fill and 2 feet of compacted clay. The ponds have a leachate collection system located beneath the membrane liner with test and monitoring wells outside the pond. The WDRs require that the solid material be removed from the holding pond in a manner that minimizes the likelihood of damage to the liner.

Geothermal fluids from the brine ponds are injected into the geothermal resource through injection wells. At the brine ponds, solid materials precipitate from the brine fluids when temperature and pressure decrease. The solid materials that accumulate at the bottom of the brine pond are periodically removed to ensure sufficient freeboard and overflow capacity. Under normal operating conditions, the liquid in the brine pond is at a temperature ranging from ambient temperature to 230 degrees Fahrenheit (ºF). The removal of solid material from this process unit is challenging, given the fact that this unit is typically an active unit and removal of the precipitated solids must be accomplished in a pool of liquids. Previously, using a track-hoe where an operator sits in the cab of the equipment, solids were moved from their accumulated location to an area near the edge of the brine pond. The solids were then lifted by the track-hoe bucket and placed directly into a disposal trailer or bin. Solid materials removed from the brine ponds are disposed of as non-RCRA hazardous waste at a permitted Class I facility.

Beginning in 2008, CalEnergy modified its operations at Leathers, Elmore, and Unit 3 with respect to removal of solids from the brine ponds, by utilizing a Toyo™ pump in the brine pond to minimize physically removing material with a track-hoe bucket. The submersible pump contains an aggressive rotating impeller that is capable of agitating compacted solids/liquid mixtures, lifting the mixture, and propelling the mixture out of the pump outlet with sufficient force that it can be moved to a shaker for separation. Larger solids are moved and placed into bins for off-site disposal as non-RCRA hazardous waste at a permitted Class I facility. From the pump/shaker, small (less than 50 micron) particles and associated liquids return to the brine processing flow. Solids are removed as filter cake and the fluids are re-injected into the

geothermal resource. Removing settled solids by utilizing the pump/shaker has reduced the need for physical removal of the settled solids.

Hydroblasting Operations

Due to the high solids content of the brine (250,000 to 300,000 ppm) used in the geothermal energy production process, pipes used to move brine throughout the facility and other equipment that comes into contact with the brine may become coated with solid residues, referred to as "scale." To ensure that facility equipment and pipes continue to operate as designed, water is sprayed at high pressure into or onto the pipe or equipment to remove the geothermal solid scale in a process known as "hydroblasting." The area specifically designated for hydroblasting operations is called the hydroblast pad and consists of a concrete floor with apron and 12-foot walls on three sides to minimize the potential impact from hydroblast operations. The liquids produced by this process drain into sumps at the hydroblast pad and are then filtered and transferred from the sumps to a storage tank. The liquids are then transferred to a brine pond for injection into the geothermal resource. Based on sampling, the liquids from the hydroblasting operations do not exhibit characteristics of hazardous waste. Solid materials are captured in the filters and removed for proper off-site disposal as non-RCRA hazardous waste at a permitted Class I facility.

Since the writing of the CACA, several modifications have been made to the construction and operations at the hydroblast pads at the Site. At the Leathers hydroblast pad, 12-foot walls were built on three sides of the pad to minimize the potential impact from hydroblasting operations. At Central Services, hydroblasting operations ceased during the fourth quarter of 2007. The hydroblast pads at Hoch and Units 1 and 2 consist of a concrete floor with apron and 12-foot walls on three sides to minimize the potential impact from hydroblast operations. The liquids produced by this process drain into sumps at the hydroblast pad and are then filtered and transferred from the sumps to a storage tank prior to being transferred to a brine pond for injection into the geothermal resource. The hydroblast pad at Unit 3 has not been used since early 2002.

Other Areas of Concern

At the Leathers Facility, an additional area of concern was identified in the second part of Paragraph 2.2(d) of the CACA. This area, referred to as the equipment yard, is located behind the plant and was previously used to store process piping. Currently, only new or cleaned piping is stored in this area. Since 2004, the pipes have been removed and approximately 2 to 4 inches of soil have been scraped and disposed of according to Federal, State, and local regulations. As required by the CACA, this area was included in the PEA investigation.

At the Elmore Facility, an additional area of concern was identified in the first part of Paragraph 2.2(e) of the CACA. This area, referred to as the zinc recovery storage area, is located to the west of the plant and was used as a temporary staging area to store bins containing resin during the construction of a zinc recovery facility which has ceased operation. This area was included in the PEA investigation.

Two additional AOCs are identified in the CACA for Region 1. At Units 1 and 2, paragraph 2.2(g) of the CACA requires samples to be collected in "the area adjacent to the north yard concrete slab." This area was included in the sampling of the Unit 1 hydroblast pad and the

former filter cake bay. This entire sampling area at Units 1 and 2 was treated as one AOC in the PEA investigation. At Units 3 and 4, the first part of Paragraph 2.2(f) of the CACA refers to the area south of the hydroblast pad. The sampling in this area was included as part of the sampling at the hydroblast pad and surface impoundment area. The entire sampling area at Units 3 and 4 was treated as one AOC in the PEA investigation.

2.2 Nature and Extent of Contaminants

During the PEA investigations, data of known quality was collected to identify the nature and extent of release of constituents of concern including arsenic and lead. The sampling strategy was designed to identify the presence of metals in surface soils in the vicinity of the AOCs. With DTSC concurrence, the PEA investigations began at the Leathers Facility. A soil sampling workplan for Leathers was submitted to DTSC on May 31, 2007 and approved by DTSC on June 7, 2007, followed by immediate implementation of the workplan (Iris Environmental 2007a and Cal/EPA 2007b). The results of the soil sampling conducted at Leathers were reviewed with DTSC followed by submittal of the other four PEA workplans (Iris Environmental 2007b, c, d, and e). Upon receipt of DTSC's approval of the four workplans, the first round of soil sampling was conducted in November 2007. The results of the sampling program were discussed with DTSC in a meeting at the DTSC offices in Cypress on January 31, 2008. A workplan for the step out sampling for the five PEAs was submitted to the DTSC on February 12, 2008, and upon receiving DTSC's approval on February 28, 2008, the step out sampling was performed in March 2008 (Iris Environmental 2008 and Cal/EPA 2008). In addition, CalEnergy conducted a background arsenic study, presented in the PEA Investigation reports and the RAW (Cal/EPA 2007c).

2.2.1 Subsurface Investigations

Several rounds of shallow soil sampling were conducted at the AOCs identified in the CACA in 2007 and 2008. Although arsenic and lead are specifically identified in the CACA, DTSC requested that representative soil samples be analyzed for Title 22 metals. As approved by the DTSC, during the first round of sampling in June 2007 at Leathers, 30 percent of all samples collected were analyzed by USEPA Method 6010B/7471A. The remaining 70 percent of the samples were analyzed for only arsenic and lead. The same analyses were conducted for the first round samples collected in November 2007 at the other facilities. With DTSC's concurrence, soil samples collected during the March/September 2008 step-out sampling program were analyzed for arsenic only.

Soil samples were collected from depths of 0 to 4 inches and 8 to 12 inches from the ground surface. Samples obtained from the top of the berm of the brine pond were acquired using a hand auger and placed into four-ounce glass jars with Teflon®-lined caps. All other samples were collected using push probe equipment and acetate sleeves. Samples were maintained under proper storage conditions and chain of custody protocols and delivered to a California-certified laboratory, Positive Lab Services of Los Angeles, California.

Based on results obtained from the first round of sampling conducted in June 2007 at Leathers and at the other facilities in November 2007, a step-out sampling program was proposed and approved by DTSC to delineate the areas with elevated (above 26 mg/kg background) arsenic

concentrations. Step-out sampling was conducted between March and September 2008. The results were presented to the DTSC in draft PEA Investigation Reports. After receiving and addressing the DTSC's comments on the draft reports, the final PEA Investigation reports were submitted to the DTSC on December 23, 2009 (Iris Environmental 2009a, b, c, d, and e). On December 30, 2009, the DTSC issued the "PEA Approval Letters" (Cal/EPA 2009a, b, c, d, and e).

2.2.2 Background Arsenic Study and Screening Levels

The cleanup goal for arsenic is based on a soil arsenic study conducted by CalEnergy in 2007. The objective of the study was to investigate the presence of arsenic outside the area of the facilities. The results of the study were presented in the PEA Investigation reports (Iris Environmental 2009a, b, c, d, and e) and the RAW. The arsenic results did not show a systematic decrease in concentration with distance from the facility. On November 8, 2007, based on the 95 percentile of the background study data set, the DTSC determined that the Site-specific background arsenic concentration is 26 mg/kg (Cal/EPA 2007c). This Site-specific background concentration of 26 mg/kg was used as the cleanup goal for arsenic. For lead, the industrial CHHSL of 320 mg/kg (Cal/EPA 2005) was used as the cleanup goal.

2.2.3 Ecological Screening Evaluation

Iris Environmental, on behalf of CalEnergy, retained Chambers Group, Inc. (Chambers) to conduct an ecological screening evaluation at the facilities. Chambers conducted a biological survey at the Site on September 19 and 20, 2007, and prepared a *Biological Survey Report* included as an appendix to the PEA Investigation reports (Iris Environmental 2009 a, b, c, d, and e).

In general, the facilities are sparsely vegetated and provide poor habitat for wildlife. The chemicals of concern are confined to the soils of unvegetated portions of the Site. The areas of concern consist of hard-packed soil and show no evidence of wildlife use. Animals may occasionally come in direct contact with contaminated soils by ingestion, dermal contact, or inhalation of wind-blown soils. Predators potentially could be exposed to chemical of potential concern through the food web by eating organisms that had been in direct contact with contaminated soils. Because of the low habitat value of the AOCs, exposure of ecological receptors to contaminants of concern would be minimal.

No sensitive wildlife species would be expected to regularly use the facility on either a year-round or seasonal basis. Some sensitive species may visit the power plant to forage. However, because of the poor habitat on the Site and the availability of superior foraging opportunities in the surrounding area, foraging at the Site by sensitive species would be expected to be minimal and, therefore, the potential for them to acquire significant body burdens of the chemicals of concern would be low. Sensitive species in the surrounding area could on rare occasions eat an animal that had foraged at the Site within an area of concern or breathe contaminated dust transported from the facilities to the surrounding area. The amount of dust that would be inhaled by an animal outside the Site and/or the percentage of the diet of any predator that would be composed of animals that had foraged within an area of concern at the facilities would be

extremely low. Chambers concluded that the chemicals of concern at the facilities pose minimal risk to ecological receptors.

2.2.4 Human Health Screening Evaluation

In general accordance with the PEA Guidance Manual (Cal/EPA 1994), the data set generated at each facility was evaluated to identify potential human health risks under a residential land use, with a targeted focus on addressing soils impacted with metals. In addition, the PEA also included an evaluation of potential health risks associated with exposures to metals in soils under a commercial/industrial land use scenario and, with concurrence from the DTSC, the exposure point concentrations for this scenario were estimated at 95% upper confidence limits of the mean concentrations (UCL95s). Arsenic was the driving factor for the human health screening evaluations. The results of lead sampling conducted during the PEA investigation were initially compared to the 2004 USEPA Preliminary Remediation Goal (PRG) for industrial soil of 800 mg/kg. During the development of the RAW, the industrial CHHSL of 320 mg/kg was used as the cleanup goal for lead (Cal/EPA/OEHHA 2009f).

3.0 REMOVAL ACTION WORKPLAN

As evaluated in the RAW, scraping/excavation and off-site disposal were selected as the appropriate remedial approach for addressing the shallow impacted soil at the CalEnergy facilities. Following is a general description of the tasks implemented during the removal activities completed at the Site. A detailed description for each facility, including the extent of scraping/excavation, confirmation sampling locations, and analytical methods used is included in Section 4.

3.1 Mobilization

Before excavation activities, the Site was prepared by conducting the following activities:

- Health and safety equipment and supplies were positioned for use when needed.
- Underground Service Alert (USA) was notified of the excavation activities. Additionally, CalEnergy personnel marked underground utilities.
- Global Positioning System (GPS) and a measuring wheel were used to mark the areas to be scraped/excavated.
- Work zones were identified and clearly marked. Work zones included the exclusion, decontamination, and support zones. The exclusion zone included all areas of excavation, contaminated soil staging area, and the truck loading area. The decontamination zone was located immediately adjacent to the exclusion zone for the purposes of decontaminating personnel, equipment, and vehicles as they exit the exclusion zone. The support zone was located within the designated work area, but outside of the exclusion and decontamination zone. The support zone was used to temporarily store equipment, vehicles, clean soil, and personnel.

- The staging area for stockpiling of impacted soils was identified and marked. At some locations, soils were loaded immediately into bins for off-site disposal.

- Other Site-specific precautionary measures, including but not limited to provisions against dust, odor, and storm water run-off, were implemented as necessary.

- A Site-specific health and safety plan was prepared by Iris Environmental for the excavation and sampling activities. In addition, CalEnergy maintains rigorous health and safety requirements.

In addition, CalEnergy

- Provided training to all contractors.

- Provided water and water tanker trucks for dust control.

- Mobilized the necessary equipment and supplies to the Site.

3.2 Documentation

Prior to remedial excavation activities, photo-documentation of the Site was performed (Appendices A through E). The photographs, taken with a digital camera, show the condition of the Site prior to work activities. The excavation limits were surveyed by GPS and/or a measuring wheel and documented.

During field activities, daily logs were maintained that included:

- Sign-in and sign-out of all personnel at the Site
- Activities conducted
- Equipment used
- Excavation material types and quantities
- Materials hauled to the Site, material used, and material hauled off-site
- Surveyed excavation area boundaries
- Field monitoring equipment readings and calibration
- A record of all formal Site meetings such as health and safety meetings, daily tailgate meetings, and agency meetings

3.3 Scraping/Excavation and Restoration

This section describes the soil scraping/excavation, backfill, and dust control activities associated with the excavation work. The specific areas scraped/excavated at each facility are described in Section 4 and shown on Figures 3 through 10. Before excavation began, the remedial areas were measured and clearly marked. A minimum of 5 inches of soil was removed from each area using heavy equipment, except where hand digging was required to protect structures at the Site. Due to the nature of the heavy equipment and the operation, as much as 8 inches of soil may have been removed.

3.3.1 Equipment

Excavation and backfill activities required a combination of the following equipment:

- Front-end loaders and motor graders for excavation, loading, and backfilling.
- Excavators and backhoes for excavation and loading.
- A water truck for dust suppression during soil removal and replacement.
- Roll-off bins and end-dump trailers for removing impacted soil and dump trucks for import of clean backfill soil.

3.3.2 General Excavation Procedure

The excavation procedure was conducted in the following general sequence. Updates on the progress were provided to the DTSC on a regular basis.

1) Developed staging areas, access paths for equipment, work zones, and decontamination areas for use during soil removal and stockpiling activities to reduce the potential of tracking waste off-site.

2) Spot excavated areas where PEA sampling results indicated that soil may be considered hazardous (i.e., arsenic concentration is higher than 500 mg/kg) using a backhoe and placed the excavated soil directly into covered roll-off bins for disposal as described in Section 3.5. Before continuing excavation, boundary samples were collected and analyzed using the protocols described in Appendix G. Potentially hazardous soil to be disposed of as hazardous was located at Leathers hydroblast pad and equipment yard, and at Unit 3 hydroblast pad. Summaries of the results of the hazardous area boundary sampling are included in Appendix H and the laboratory reports are included in Appendix I.

3) Excavated contaminated soil to the extent and depths at each AOC as described in Section 4.

4) Stockpiled excavated soil on plastic and covered, to prevent erosion by wind and water, prior to disposal. Stockpile cover was monitored and maintained throughout the profiling process. Profile sampling is described in Section 3.5.

5) Used a hand-held X-Ray Fluorescence (XRF) analyzer as a preliminary screening tool to collect arsenic readings at the edges of each excavated area. If the XRF readings indicated arsenic or lead concentrations were below the cleanup goal of 26 mg/kg for arsenic and 320 mg/kg for lead, conducted confirmation soil sampling as described in general in Section 3.4 and at each scraped/excavated area as described in Section 4.

6) Compared the confirmation soil results to the cleanup goals: 26 mg/kg for arsenic and 320 mg/kg for lead. The laboratory reports are included in Appendix J. As appropriate, continued excavating and conducted additional confirmation sampling.

3.3.3 Restoration

After the soil removal activities and confirmation sampling were completed, CalEnergy re-graded or backfilled the scraped/excavated areas to match the existing ground surface. During the grading and backfilling activities, CalEnergy implemented their standard dust mitigation procedures.

3.3.4 Dust Control

Standard CalEnergy dust control measures (including water spray application) were followed during the scraping/excavation and restoration activities.

3.3.5 Decontamination Procedures

In order to prevent residual contamination from being left on-site by construction equipment and personnel, decontamination procedures were developed. Prior to loading excavated materials into bins, plastic sheeting was placed on the ground such that any spilled material during loading would be prevented from contacting the ground surface. Upon completion of loading, any debris was placed in the transportation vessel and the plastic sheeting was reused or disposed. Personal protective equipment, such as disposable coveralls, were removed and discarded in the contamination reduction zone.

3.4 Confirmation Sampling Program

Upon completion of the initial scraping/excavation activities at each area, a hand-held XRF analyzer was used to screen whether the soil at the boundary of the excavation was below the arsenic cleanup goal of 26 mg/kg, following the USEPA Method 6200, "Field Portable X-Ray Fluorescence Spectrometry for the Determination of Elemental Concentrations in Soil and Sediment." Three readings were collected at the proposed confirmation sample location and averaged. If the screening average indicated that the edge of the excavation contained arsenic at concentrations significantly above the arsenic cleanup goal, the boundaries of the excavation were extended at a minimum of approximately 15 feet, and the process repeated until the screening values were below the arsenic cleanup goal.

After completion of the preliminary screening using the XRF, confirmation sampling at the boundaries and the bottom of each excavation was conducted as described at each area in Section 4. Confirmation samples were not collected from areas previously characterized or with obstructions. The sampling protocols are further described in Appendix G and photographs of the activities are included. All but one confirmation sample was collected using push probe equipment (the last confirmation sample at Leathers hydroblast pad was collected by hand). Samples were labeled by facility, and include a "C" to indicate a confirmation sample or "CH' to indicate a sample collected in the hazardous areas. Confirmation samples ("C") included a designation of "B" for a bottom sample or "S" for sidewall. Hazardous area soil samples ("CH") included a designation of "F" for floor sample or another letter for sidewall sample. The depth of the sample was also included in the sample identification and was measured from the soil surface after excavation/scraping as described in Appendix G.

The soil samples were analyzed for arsenic (and lead at the Leathers hydroblast pad) by Positive Lab Service, a California-certified laboratory, consistent with the methods used during the PEA investigations and as described in Appendix G. The laboratory reports for the hazardous area sampling are included in Appendix I and the laboratory reports for the confirmation soil samples are included in Appendix J. The confirmation samples results are summarized by AOC in Tables 1 through 8.

3.5 Profiling, Transporting, and Disposal

Excavated material removed from non-suspected hazardous areas (arsenic concentrations below 500 mg/kg during the PEA investigations) was placed on plastic, covered, and the cover monitored and maintained during the profiling period. The stockpiled soil was profiled as described in Appendix K and included collecting four-point composite samples for laboratory analysis. With DTSC approval dated February 11, 2011, the originally proposed sampling frequency of 1 sample per 20 tons was revised to 1 sample per 250 cubic yards of soil. A minimum of one composite sample was collected from each stockpile. The laboratory reports for the stockpile samples are included in Appendix K.

The soil classified as non-hazardous and meeting the acceptance criteria was transported and disposed by CalEnergy at DVC, a CalEnergy-owned licensed and approved Class II facility located at 3301 West Highway 86, Brawley, California, 92227. The current permit for DVC, dated January 1, 2011, is included in Appendix F. The transportation manifests for the material disposed at DVC are included in Appendix L and summarized in Table 9.

Material that could not be accepted at DVC and the material removed from areas where arsenic concentrations were identified as higher than 500 mg/kg during the PEA investigations was disposed of at Waste Management's Kettleman Hills (Kettleman), a Class I landfill. Transportation manifests for material disposed at Kettleman are included in Appendix L and summarized in Table 10.

Wastewater generated during the field activities, such as decontamination liquids, was disposed of by CalEnergy.

During loading of the soil, as described in Appendix K, dust emissions were monitored and mitigated as necessary. All transportation activities were performed in strict compliance with regulations and ordinances. The hauling contractor(s) used to transport non-hazardous and hazardous waste were fully licensed and permitted by the State of California. Hazardous waste haulers were certified by the State of California as a hazardous waste hauler, and appropriately permitted to haul contaminated waste material. All Department of Transportation (DOT) and California Highway Patrol (CHP) safety regulations were strictly followed by both hazardous and non-hazardous waste haulers.

4.0 RAW IMPLEMENTATION

Described in the following sections, for each facility, are the soil removal activities, confirmation sampling, and restoration activities. As described in general in Section 3, the areas identified during the PEA investigation were remediated by scraping/excavation between February 9, 2011 and June 23, 2011. GPS coordinates and measurements taken during the PEA investigation were

used to identify the areas to be addressed. Confirmation sampling was conducted during this period, followed by CalEnergy restoring the areas to ground surface by re-grading and backfilling. After stockpile profiling and removal was completed, Iris Environmental conducted an inspection of the restored areas on August 9, 2011.

Photos taken during implementation of the RAW activities at each facility are included in Appendices A through E. In addition, photos of the restored areas are also included in these appendices. Following is a description of the areas addressed and the confirmation sampling locations for each facility.

4.1 Updates to DTSC and Deviations from RAW

On February 1, 2011, the DTSC approved the RAW. On February 8, 2011, Iris Environmental provided an implementation schedule to the DTSC by electronic mail, followed by telephone conversation with DTSC personnel. Soil removal activities were initiated on February 9, 2011.

On February 11, 2011, Iris Environmental received approval from DTSC to modify the stockpile sampling frequency as explained in Section 3.5. Updated implementation schedules, photographs, and explanations of the progress of excavation and backfilling were provided to the DTSC on February 18, March 7, March 21, and May 31, 2011. DTSC attended a site walk during the field activities on March 1, 2011. The explanations to DTSC included deviations from the area proposed to be addressed in the RAW. The areas were extended based on confirmation soil results that exceeded the cleanup goal and restrictions based on structures and encountering geocrete.

The presence of geocrete restricted excavation at two locations: West of Unit 1 hydroblast pad and Hoch surface impoundment.

- The excavation west of the Unit 1 hydroblast pad was only extended 45 feet instead of 60 feet as planned, because of a road underlain by geocrete on the other side of permanent piping approximately 45 feet from the pad. DTSC was notified on February 18, 2011 of the change and observed the excavation during the site walk on March 1, 2011.

- The excavation north of the Hoch surface impoundment was ceased because the concentration of arsenic increased with depth. CalEnergy verified that geocrete had been placed beneath the asphalt road that bounded the excavation. On June 6, 2011, DTSC approved to limit the excavation based on encountering previously unknown geocrete, and excavation activities were ceased at this location.

On July 28, 2011, DTSC was notified that Iris Environmental would be conducting the final inspection of the excavated and restored areas; the inspection was conducted on August 9, 2011. DTSC did not attend the inspection.

Following is a description of the excavated areas by AOC.

4.2 Leathers

The areas addressed at the Leathers facility are the surface impoundment, downwind of the surface impoundment, the filter cake bay area (Figure 3), the hydroblast pad (Figures 4a and 4b), and the equipment yard (Figures 5a through 5e). Because the filter cake bay is adjacent to the surface impoundment and the downwind area, these areas are described together.

4.2.1 Leathers Surface Impoundment and Filter Cake Bay Area

During March and April 2011, as shown on Figure 3, three areas with shallow arsenic-impacted soil were excavated at the Leathers surface impoundment and filter cake bay area. During the PEA investigation, lead was not detected above 320 mg/kg at these areas. Soil samples collected in this area are designated as "LSI." Confirmation soil samples were analyzed for arsenic and the sampling results are summarized in Table 1.

The first area identified with arsenic-impacted soil is to the east the filter cake bay, near the northeast corner of the surface impoundment (LSI-14 and LSI-14E-15'). An area approximately 90 by 90 feet was scraped to a depth of 5 inches. This area was bounded to the west and north by an asphalt road and to the south and east by permanent piping. In this area, the confirmation sampling program was conducted on April 1, 2011 and consisted of one bottom confirmation sample (LSI-C-B2); the arsenic in this sample was reported at 9.23 mg/kg, below the cleanup level. This result is bounded by arsenic concentrations that were below the cleanup goal at the samples collected during the PEA investigation to the west (LSI-14), to the south (LSI-15), and to the east (LSI-14E-30').

The second area identified with arsenic-impacted soil was at one of the 11 sample locations on the berm of the surface impoundment, (LFC-7 at 0.3-foot at 38.8 mg/kg). An area at LFC-7 on the berm, approximately 5 feet by 5 feet, was excavated and backfilled by hand to minimize damage to the berm. The arsenic concentrations at samples collected immediately to the north (LFC-8) and south (LFC-6) of the area were reported below the cleanup goal; therefore, no confirmation sampling was necessary in this area.

The third area identified with arsenic-impacted soil is southeast of the surface impoundment. A "L" shaped area between the surface impoundment and the southwest corner of the fresh water pond, approximately 150 by 50 feet and 90 by 75 feet, was scraped to 5 inches (to include the PEA samples LSI-18, LSI-18S-15', and LSI-18SE). The southeastern corner of the excavation was extended 15 feet laterally based on elevated XRF arsenic readings. On April 1, 2011, three sidewall confirmation soil samples were collected from the south edge and the west and east sides of this area and analyzed for arsenic (LSI-C-S1, LSI-C-S2, and LSI-C-S4). Confirmation sampling was conducted at the southeast corner extension on April 22, 2011 (LSI-C-S3). The maximum arsenic concentration in these samples was 17.0 mg/kg at LSI-C-S3. One bottom confirmation sample was collected, LSI-C-B1, and arsenic was reported at 9.41 mg/kg.

Approximately 580 tons of soil were removed from the Leathers surface impoundment and filter cake bay area and disposed of at DVC. All confirmation samples collected from this area were below the arsenic cleanup goal of 26 mg/kg (Table 1 and Figure 3).

4.2.2 Leathers Hydroblast Pad

Between March and June 2011, arsenic- and lead-impacted areas identified during the PEA investigation were excavated. The areas excavated/scraped are shown on Figures 4a (arsenic concentrations left in place) and 4b (lead concentrations left in place). The samples collected in this area are designated as "LHB." All confirmation samples at the Leathers hydroblast pad were analyzed for both pulverized arsenic and lead. The confirmation sampling results are summarized in Table 2.

Excavation at the Leathers hydroblast pad began with 15-foot radius spot excavations at LHB-1E, LHB-6E, LHB-8N, and LHB-10N (PEA sample locations) where the soil was identified as hazardous during the PEA investigation (i.e., arsenic concentration was higher than 500 mg/kg). Approximately 5 inches of soil was removed. The excavated soil was placed directly into covered roll-off bins for disposal at a Class I landfill (Section 3.5 and Appendix L). The spot excavation at LHB-8N was extended 15 feet to the north based on XRF readings. Boundary and bottom soil samples were collected from these areas and analyzed before scraping was continued. Based on the laboratory result being above 500 mg/kg near LHB-6E, the excavation was extended 15 feet to the southeast. The boundary sample subsequently collected at this extension (LHBCH-6E-D) was below 500 mg/kg, the hazardous criteria. Based on the sampling in these areas, all hazardous material was removed prior to proceeding with additional soil removal (Appendices H and I). Approximately 166 cubic yards of soil from the identified area was removed and disposed at Kettleman.

The next stage of excavation at Leathers hydroblast pad consisted of removing approximately 5 inches of soil from the area surrounding the hydroblast pad to a minimum distance of 100 feet from the edges of the hydroblast pad. At the five locations where the PEA investigation results showed arsenic concentrations as above the cleanup goal of 26 mg/kg at depths to 1.3 feet deep (LHB-6E, LHB-2E, LHB-2S, LHB-5S, and LHB-1W), the excavation was advanced to a depth of 13 inches and extended approximately 15 feet laterally from the sample locations. The excavation was extended as shown on Figures 4a and 4b based on elevated XRF readings or soil confirmation laboratory results. Based on the arsenic concentration results of confirmation sampling point, LHB-C-B7, the excavation was extended to a depth of 9 inches and extended approximately 15 feet laterally from the sample location. The deeper sample at this confirmation sample was below the arsenic cleanup goal. The northern boundary of the Leathers hydroblast pad excavation merged with two excavations from the equipment yard, centered at LEY-3 and LEY-5 (Figure 5a).

During profile sampling that was conducted at each stockpile, a portion of one of the stockpiles generated during the excavation at Leathers hydroblast pad was identified as unacceptable for disposal at DVC, therefore; approximately 80 cubic yards of this stockpile were disposed of at Kettleman (Table 10). The other stockpiles consisted of approximately 3,708 tons of soil and were disposed at DVC.

Several rounds of soil confirmation sampling were conducted as part of the soil removal activities at the Leathers hydroblast pad between February and June 2011 (Table 2). The last confirmation sample (LHB-C-S21) was collected by hand on June 23, 2011; this was the only sample collected that day. Initially, 21 confirmation samples, spaced approximately every 50

feet, were collected from the boundaries of the excavated area and analyzed for arsenic and lead (Figures 4a and 4b). Where the hydroblast pad excavation extended into the equipment yard excavation areas, three samples collected around the equipment yard excavations, LEY3-C-S4, LEY5-C-S4, and LEY5-C-S6, also serve as sidewall confirmation samples for the hydroblast pad. Eleven samples were collected from the base of the excavation (LHB-C-B1 to LHB-C-B11), spaced approximately every 50 feet between the hydroblast pad and the extent of the excavation. All confirmation sidewall samples and bottom samples left in place were below the cleanup goal of 26 mg/kg for arsenic and 320 mg/kg for lead (Figures 4a and 4b; respectively).

4.2.3 Leathers Equipment Yard

As part of the PEA investigation, the Leathers equipment yard was divided into 12 grids, each approximately 200 by 200 feet, and during the first round of sampling, one sample was collected from each grid. The sample designations included "LEY" and the grid number. During the PEA investigation, arsenic-impacted shallow soil was identified at four grids: LEY-1, LEY-3, LEY-5, and LEY-10 (Figure 5a). Lead was not reported above 320 mg/kg in any of the samples at the equipment yard.

As part of the RAW, excavation was conducted at the equipment yard between February and June 2011. The confirmation samples were analyzed for arsenic and the results are summarized by grid in Tables 3a to 3d. From all four excavations at the Leathers equipment yard, approximately 3,548 tons of soil were removed and disposed at DVC.

- Grid LEY-1: Spot excavation was conducted at LEY-1S where the soil was identified as hazardous (i.e., arsenic concentration was higher than 500 mg/kg). The excavation removed approximately 5 inches of soil and extended radially approximately 15 feet from the sample location. See Figure H-2 in Appendix H for extent of excavation. The excavated soil was placed directly into covered roll-off bins and approximately 36 cubic yards of soil were disposed at Kettleman. Before further scraping was done, soil samples (LEYCH-1S-A, -B, -C, and -F) were collected and analyzed. The arsenic concentrations in these samples were all below 500 mg/kg, the hazardous criteria, and indicated that the hazardous material was removed prior to proceeding with additional excavation at LEY-1.

  Once spot excavation was completed, an area of approximately 140 by 110 feet was scraped to a depth of 5 inches (Figure 5b). XRF readings collected from the middle of the eastern side of the excavation (LEY-1E) indicated that the arsenic concentrations were above the cleanup goal. This area was extended east in a semi-circle of 15 feet radius in 4 rounds of excavation, each followed by the collection of XRF readings. Instead of stepping out another 15 feet, to efficiently assess the extent of contamination, potholes were dug at 15 feet increments in lines laterally spaced approximately 50 feet apart. XRF readings were collected from the sidewalls of the potholes, starting from the excavation and stepping out one pothole at a time. Once the XRF indicated that the arsenic concentration was below the cleanup goal, a confirmation sample was collected, followed by excavating the area to a depth of 5 inches.

Several rounds of confirmation sampling were conducted between March and June 2011 and the results are summarized in Table 3a. Samples were collected along the boundary, at the corners of the excavation, and at the bottom of the excavation. Though the area was characterized to the east by sample location LEY-1E, XRF readings collected in this location indicated that further excavation was needed, as described above. All sidewall samples and bottom samples left in place were below the arsenic cleanup goal of 26 mg/kg, except for LEY1-C-S4, which contained arsenic at 27.0 mg/kg, significantly close to the cleanup goal of 26 mg/kg. The results of the confirmation samples left in place are shown on Figure 5b.

- Grid LEY-3: Initially, an area of approximately 140 by 100 feet was excavated to a depth of 5 inches (Figure 5c). The boundaries were extended based on XRF readings and confirmation sampling.
  - The northeastern corner was extended 15 feet in all directions, based on XRF readings.
  - The northwestern corner was extended 30 feet in all directions, based on XRF readings.
  - The southwestern corner was extended based on a confirmation result collected on February 25, 2011 (sample LEY3-C-S1, Table 3b). The extension was 60 feet in the southwest direction based on XRF readings. In addition, at the confirmation sample location, the depth of the excavation was extended to 9 inches and extended approximately 15 feet laterally from the sample location.
  - The western boundary was extended based on XRF readings using the pothole method described in the above section discussing LEY-1.

  The results of the confirmation sampling conducted at LEY-3 are summarized in Table 3b. The arsenic concentrations left in place are shown on Figure 5c. The Leathers hydroblast pad excavation merged with the eastern side of the LEY-3 excavation (Figure 5a), and the confirmation sample LEY3-C-S4 is a confirmation sample for both the LEY-3 and the Leathers hydroblast pad excavations. All sidewall samples and bottom samples left in place were below the arsenic cleanup goal of 26 mg/kg.

- Grid LEY-5: Initially, an area of approximately 100 by 75 feet was excavated to a depth of 5 inches (Figure 5d). The first round of confirmation sampling was conducted on February 25, 2011, and based on elevated arsenic concentrations in several confirmation samples, the excavation was extended.
  - The southeastern corner (at LEY5-C-S3) was extended 15 feet in all directions.
  - The southwestern corner (at LEY5-C-S2) was extended 30 feet in all directions and an additional 30 feet to the east based on elevated XRF readings. In addition, at the confirmation sample location, the depth of the excavation was extended to 9 inches.

  As described previously, the Leathers hydroblast pad excavation was extended and merged with the southwestern corner of the LEY-5 excavation. The confirmation sample LEY5-C-S5 was above the arsenic cleanup goal of 26 mg/kg; therefore, both the LEY-5 and the hydroblast pad excavations were extended to the southeastern corner of the LEY-5 excavation (the location of confirmation sample LEY5-C-S6).

The results of the confirmation sampling conducted at LEY-5 are summarized in Table 3c. The arsenic concentrations left in place are shown on Figure 5d. The confirmation samples LEY5-C-S4 and LEY5-C-S6 serve as common confirmation sample for both the LEY-5 and the Leathers hydroblast pad excavations. The area was characterized to the north and east during the PEA investigation by soil sample locations LEY-5N and LEY-5E, respectively. All sidewall samples and bottom samples left in place were below the arsenic cleanup goal of 26 mg/kg.

- Grid LEY-10: Initially, an area of approximately 140 by 140 feet was excavated to a depth of 5 inches (Figure 5e). Based on acceptable XRF readings, on March 11, 2011, confirmation sampling was conducted at four locations on the southern and western side of the excavation. In addition, a bottom sample was collected (LEY10-C-B1). The results were below the cleanup level of 26 mg/kg (Table 3d).

  - On the eastern side of the excavation, an unacceptable XRF reading was measured at one location and the excavation was extended 15 feet in all directions. Subsequent XRF readings were below the cleanup level for arsenic and confirmation sample LEY-C-S6 was collected on March 22, 2011.

  - On the northern side of the excavation, all XRF readings were unacceptable and the excavation was extended.

    - At the northwest corner, the excavation was extended three times to the north and east at 15-foot increments, until XRF readings were acceptable. The excavation was limited to the west by above ground piping. Confirmation sampling conducted on April 22, 2011, showed an arsenic concentration below the cleanup goal.

    - At the central location on the northern boundary, the excavation was extended two times at 15-foot increments, until XRF readings were acceptable. Confirmation sampling conducted on April 1, 2011, showed an arsenic concentration below the cleanup goal. The excavation extending from the northeast corner merged with this excavation.

    - At the northeast corner, the excavation was extended twice to the east in 15-foot increments and to the north using the pothole method described for Grid LEY-1. Confirmation sampling conducted on May 6, 2011 was not acceptable. The excavation was extended approximately 100 feet to the north of the proposed excavation. Based on subsequent confirmation sampling, the boundaries of the extension were below the cleanup goal for arsenic.

All confirmation soil sample results are summarized in Table 3d. All sidewall samples and bottom samples left in place were below the arsenic cleanup goal of 26 mg/kg.

4.3 Central Services

As shown on Figure 6, arsenic-impacted soil was excavated to the east of the hydroblast pad. During the PEA investigation, lead was not reported above 320 mg/kg in any of the samples at

Central Services. The soil samples collected in this area are designated as "CS" and were analyzed for arsenic. The confirmation sampling results are summarized in Table 4 and those left in place are shown on Figure 6.

Soil was excavated between March and May 2011 to a depth of 5 inches, approximately 80 feet south, 100 feet north, and 120 feet east of the hydroblast pad. A fenced area located to the southeast of the hydroblast pad was not included in the excavation area. Approximately 1,610 tons of soil were removed and disposed at DVC.

On April 1, 2011, ten sidewall confirmation samples, CS-C-S1 to CS-C-S10, spaced at 50 foot intervals along the boundary, were collected and analyzed for arsenic (Table 4). Three locations contained arsenic above the cleanup goal; therefore, the excavation at these locations was extended 15 feet in all directions. On May 6, 2011, three additional sidewall samples, CS-C-S11 to CS-C-S13, were collected at these locations. Three bottom confirmation samples, CS-C-B1 to CS-C-B3, were collected. All sidewall samples and bottom samples left in place are shown on Figure 6 and were below the arsenic cleanup goal of 26 mg/kg.

4.4 Elmore

As shown on Figure 7, the two areas addressed at the Elmore facility included east of the surface impoundment (and adjacent to the filter cake bay) and the previously-existing zinc recovery area for arsenic-impacted soil. During the PEA investigation, lead was not detected above 320 mg/kg at these areas. PEA soil samples collected in the surface impoundment area are designated as "ESI" and soil samples collected in the zinc recovery storage area are designated as "EZA." Confirmation soil samples were designated as "ELM." The confirmation sampling results are summarized in Table 5 and those left in place are shown on Figure 7. Approximately 495 tons of soil were removed from these two areas and disposed at DVC.

4.4.1 Elmore Surface Impoundment and Filter Cake Bay Area

The area east of the Elmore surface impoundment and filter cake bay was impacted by arsenic in the shallow soil. The area between the surface impoundment and the freshwater pond to the east was scraped north of sample location ESI-16 to the asphalt road located to the north of the surface impoundment. The northern portion of the impacted area extended west to the concrete pad adjacent to the filter cake bay and east to sample location ESI-12NE, where arsenic was reported as below the cleanup goal. An area of asphalt/concrete, noted on Figure 7, could not be scraped between the surface impoundment and the freshwater pond.

Two bottom confirmation samples were collected for arsenic analysis (ELM-C-B2 and ELM-C-B3). Both bottom samples were below the arsenic cleanup goal of 26 mg/kg (Table 5).

4.4.2 Elmore Zinc Recovery Storage Area

During the PEA investigation, arsenic, at concentrations greater than the cleanup goal, was reported at a depth of 0 to 4 inches at two of the nine sample locations in the previously-existing zinc recovery storage area (EZA-3 and EZA-3E; Figure 7). The PEA results did not indicate that this area was impacted with zinc. An area with an approximately 55-foot radius, centered between sample locations EZA-3 and EZA-3E, was scrapped to a depth of 5 inches. Because

piping had been installed in the zinc recovery storage area within the proposed southern scraping area, the scraped area did not extend beneath these pipes; however, this area was previously characterized by sample location EZA-3S.

One confirmation sample was collected at the excavation boundary to the east for arsenic analysis (ELM-C-S1), and one bottom confirmation sample was collected (ELM-C-B1; Table 5). The sidewall sample and bottom sample are shown on Figure 7 and were below the arsenic cleanup goal of 26 mg/kg.

4.5 Region 2: Vulcan/Hoch

As shown on Figure 8, the areas addressed at the Vulcan/Hoch facility included downwind of the surface impoundment and the hydroblast pad. Excavation was restricted in the area of the hydroblast pad by the presence of geocrete in the subsurface. During the PEA investigation, lead was not detected above 320 mg/kg at these areas. PEA soil samples collected in this area are designated as "HSI" and "HHB," respectively. The confirmation soil samples were designated as "H" and analyzed for arsenic. Approximately 404 tons of soil were removed and disposed of at DVC. The confirmation sampling results are summarized in Table 6 and those left in place are shown on Figure 8.

4.5.1 Hoch Surface Impoundment

As shown on Figure 8, the shallow soil adjacent to the east of the surface impoundment, an area approximately 30 to 50 feet wide and 200 feet long, was impacted with arsenic to a depth of 4 inches. This area is bounded by a concrete slab to the south and a road to the east. North of the surface impoundment is an asphalt surface that runs east-west between the surface impoundment and a fence that defines the northern boundary of the Hoch facility. Sampling conducted during the PEA investigation, north of this road, adjacent to the fence, showed impacted soil. However, arsenic concentrations in soil samples collected on the other side of the Site fence were below the cleanup goal. In addition, during the PEA investigation, at three of the ten locations sampled in this area, the soil collected from a depth of 8 to 12 inches was reported above the cleanup goal for arsenic (two at the north end [HSI-15 and HSI-15W] and one at the south end [HIS-14]). Where accessible in this area (east of the surface impoundment and along the northern Site boundary fence), soil was scraped to 5 inches. In addition, soil was removed to at least 13 inches at the sample locations with impacts to depths of 12 inches.

Confirmation sampling conducted near the northern Site boundary fence showed arsenic concentrations above the cleanup goal, so this portion was extended to both the east and west, along the Site boundary fence. Additional confirmation sampling showed an increase in arsenic concentration for the deeper samples at HSI-C-S2, indicating that geocrete could be adjacent to the excavation. CalEnergy verified that geocrete had been placed beneath the asphalt road that bounded the excavation. On June 6, 2011, DTSC approved a request to complete the excavation based on encountering previously unknown geocrete, and excavation activities were ceased.

The arsenic concentrations of the confirmation soil samples left in place are shown on Figure 8. The portion of the excavation to the east of the surface impoundment was bounded on all sides and the bottom samples were below the arsenic cleanup goal. At the northern portion, along the

Site boundary fence, because of newly revealed areas of geocrete, confirmation soil samples with arsenic concentrations above the cleanup goal were left in place.

4.5.2 Hoch Hydroblast Pad

The Hoch hydroblast pad is located in an area of known geocrete and the presence of the geocrete restricted soil sampling during the PEA investigation, including refusal at several locations below one foot. Sampling to the east of the hydroblast pad was inhibited by the surface impoundment and a concrete pad; therefore, the PEA investigation was conducted to the north and south of the hydroblast pad. Arsenic was reported above the cleanup goal at several sample locations at depths of 2 feet, which may be attributable to the geocrete.

The excavation area at the Hoch hydroblast pad was bounded by to the east by the surface impoundment and to the west by the presence of geocrete; therefore, two areas were scraped. One area extended approximately 60 feet north of the hydroblast pad and the second area extended approximately 60 feet south of the hydroblast pad (Figure 8). These areas were scraped to a depth of approximately 5 inches to avoid encountering geocrete. In addition, a small area located at sampling location HFC-1 (to the southeast of the hydroblast pad) was hand dug to a depth of 5 inches. Due to the presence of geocrete in this area and the presence of surface features (piping, asphalt, and other obstacles), no confirmation sampling was conducted in this area.

4.6 Region 1

Region 1 consists of Units 1 and 2, Units 3 and 4, and Unit 5 (Appendix E). At Region 1, the two areas of concern for arsenic are the Units 1 and 2 hydroblast pad and Units 3 and 4 hydroblast pad. Below is a description of the excavation activities at each hydroblast pad. During the PEA investigation, lead was not detected above 320 mg/kg at these areas.

4.6.1 Units 1 and 2 Hydroblast Pad

As shown on Figure 9, areas of arsenic-impacted shallow soil were identified to the north and west of the Units 1 and 2 hydroblast pad. PEA investigation results showed no impact to the south and east of the hydroblast pad. Lead was not detected above 320 mg/kg at the Unit 1 hydroblast pad. PEA soil samples collected in this area were designated as “1HB.” Confirmation soil samples are designated as “U1” and were analyzed for arsenic. The confirmation sampling results are summarized in Table 7.

The impacted soil was excavated to a depth of 5 inches to the north and west of the hydroblast pad. The northern portion of the area to be scraped was approximately 90 feet north of the hydroblast pad and was approximately 200 feet wide. The western portion of the scraped area was proposed to extend approximately 60 feet west of the hydroblast pad, extending approximately 100 feet in length; but, permanent injection well piping located 45 feet west of the hydroblast pad did not allow extending beyond 45 feet. Immediately beyond this piping lay an asphalt road underlain with geocrete. In order to not undermine the piping or encounter geocrete, the excavation was stopped at the pipeline. Approximately 783 tons of soil were removed and disposed at DVC.

On February 25 and March 11, 2011, confirmation sample locations, spaced at 50 foot intervals along the boundary of the excavation (U1-C-S1 to U1-C-S11), were XRF field screened and sampled for laboratory analysis. In addition, three bottom confirmation samples (U1-C-B1 to U1-C-B3) were collected. One proposed sampling location, field screened by the XRF, showed arsenic concentrations above the cleanup goal (near U1-C-S9); therefore, the excavation was extended fifteen feet in all directions at this point. Based on confirmation sampling, the excavation was extended at three other areas fifteen feet in all directions (U1-C-S1, U1-C-S7, and U1-C-S10). Confirmation sampling at U1-C-S3 showed elevated arsenic; however, this location is adjacent to the permanent piping and could not be extended. The DTSC was informed of this obstacle on February 18, 2011.

On April 1, 2011, additional confirmation samples were collected and the results were below the arsenic cleanup goal. As shown on Figure 9, all sidewall samples and bottom samples left in place, except for U1-C-S3 at a concentration of 28.9 mg/kg, which could not be removed due to permanent piping, were below the arsenic cleanup goal of 26 mg/kg (Table 7).

4.6.2 Units 3 and 4 Hydroblast Pad

As shown on Figure 10, Units 3 and 4 hydroblast pad is adjacent to the surface impoundment and is in an area of geocrete. Sampling during the PEA investigation was limited by a road to the east, the surface impoundment to the north, and geocrete to the west and south. PEA soil samples collected in this area were designated as "3HB." The confirmation soil sample was designated as "U3" and was analyzed for arsenic. The confirmation soil sampling result is summarized in Table 8.

Initially, excavation was conducted at 3HB-S1 where the soil was identified as hazardous (i.e., arsenic concentration was higher than 500 mg/kg). The excavation removed approximately 13 inches of soil and extended laterally approximately 15 feet from the sample location. The excavated soil was placed directly into covered roll-off bins and approximately 58 cubic yards were disposed at Kettleman.

On March 22, 2011, a bottom confirmation sample was collected from this area (U3-C-B1) and analyzed before further scraping was done. The area around the two sample locations with elevated arsenic concentration, near the southern edge of the hydroblast pad was excavated to 13 inches. No geocrete was encountered, but a buried slab of concrete was observed approximately 8 inches below the surface which was left in place and not disturbed. Approximately 82 tons of soil were removed and disposed at DVC. Due to the possible presence of geocrete, no additional confirmation samples were collected, per the approved RAW.

4.7 Site Restoration

Once all confirmation sampling was completed, CalEnergy re-graded the ground surfaces at all the AOCs. On August 9, 2011, Iris Environmental inspected the areas and saw that the surfaces had been restored. Pictures of the restored areas are included by facility in Appendices A through E.

5.0 CONCLUSION

During the implementation of the RAW, using the protocols described in Section 3, the areas identified during the PEA investigation were remediated by scraping/excavation. The soil removed was appropriately disposed off-site and the remediated areas restored to grade. After extensive scraping conducted at the CalEnergy Calipatria facilities, and based on confirmation sampling, the soil remaining at the AOCs is at or below the Site-specific cleanup goals, except in areas located near geocrete or where the excavations could not be further extended due to surface obstructions. The RAO of the RAW has been accomplished. The requirements of the CACA, as it pertains to the impacted areas, and DTSC PEA approval letters, have been satisfied.

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Tables

Table 1: Confirmation Sample Results -- Leathers Surface Impoundment

Sample I.D.	Type	Depth (in bgs)	Date	Arsenic (pulverized) (mg/kg)	Soil Removed or Left in Place	Laboratory Report Number
Sidewall Samples						
LSI-C-S1	P	0-4	4/1/2011	9.26	Left in Place	1104027
LSI-C-S2	P	0-4	4/1/2011	11.4	Left in Place	1104027
LSI-C-S3	P	0-4	4/22/2011	17.0	Left in Place	1104202
LSI-C-S4	P	0-4	4/1/2011	13.8	Left in Place	1104027
Bottom Samples						
LSI-C-B1	P	0-4	4/1/2011	9.41	Left in Place	1104027
LSI-C-B2	P	0-4	4/1/2011	9.23	Left in Place	1104027

Notes:

(1) Soil sample type is primary (P) or field duplicate (FD).

(2) Soil samples were collected into 4-inch acetate sleeves by direct-push method. Sample depths are presented in units of inches below ground surface (in bgs). The 0-4 in bgs samples were collected from 0 to 4 inches bgs.

(3) All soil samples were "pulverized" by machine grinding at the laboratory prior to analysis.

(4) Soil sampling results are expressed in units of milligrams per kilogram (mg/kg). Where a compound was not detected at or above the laboratory reporting limit, a less-than sign (<) and the reporting limit are shown in the table.

Table 2: Confirmation Sample Results -- Leathers Hydroblast Pad

Sample I.D.	Type	Depth (in bgs)	Date	Arsenic (pulverized) (mg/kg)	Lead (pulverized) (mg/kg)	Soil Removed or Left in Place	Laboratory Report Number
Sidewall Samples							
LHB-C-S1	P	0-4	4/22/2011	8.52	17.2	Left in Place	1104200
LHB-C-S2	P	0-4	4/22/2011	41.9	26.4	Removed	1104200
LHB-C-S2	P	4-8	4/22/2011	11.2	---	Left in Place	1104200A
LHB-C-S3	P	0-4	3/11/2011	8.89	18.4	Left in Place	1103141
LHB-C-S4	P	0-4	3/11/2011	8.72	19.0	Left in Place	1103141
LHB-C-S5	P	0-4	3/11/2011	35.7	22.1	Removed	1103141
LHB-C-S5	P	4-8	3/11/2011	8.31	--	Left in Place	1104219
LHB-C-S6	P	0-4	3/11/2011	25.5	21.2	Left in Place	1103141
LHB-C-S7	P	0-4	3/22/2011	11.2	18.0	Left in Place	1103269
LHB-C-S8	P	0-4	3/11/2011	14.0	19.7	Left in Place	1103141
LHB-C-S9	P	0-4	4/1/2011	12.0	18.8	Left in Place	1104029
LHB-C-S10	P	0-4	4/22/2011	21.4	22.1	Left in Place	1104200
LHB-C-S11	P	0-4	6/10/2011	25.3	16.8	Left in Place	1106093
LHB-C-S12	P	0-4	6/10/2011	33.3	19.6	Removed	1106093
LHB-C-S12	FD	0-4	6/10/2011	40.5	19.1	Removed	1106093
LHB-C-S12	P	4-8	6/10/2011	8.17	--	Left in Place	1107045
LHB-C-S12	FD	4-8	6/10/2011	7.90	--	Left in Place	1107045
LHB-C-S13	P	0-4	3/22/2011	13.3	19.6	Left in Place	1103269
LHB-C-S14	P	0-4	4/22/2011	14.3	20.6	Left in Place	1104200
LHB-C-S15	P	0-4	5/6/2011	13.2	19.7	Left in Place	1105059
LHB-C-S16	P	0-4	4/22/2011	11.0	20.6	Left in Place	1104200
LHB-C-S17	P	0-4	5/6/2011	73.0	21.4	Removed	1105059
LHB-C-S17	P	4-8	5/6/2011	7.16	--	Left in Place	1105059A
LHB-C-S18	P	0-4	5/6/2011	16.9	13.0	Left in Place	1105059
LHB-C-S19	P	0-4	5/6/2011	19.5	12.9	Left in Place	1105059
LHB-C-S20	P	0-4	4/1/2011	18.8	21.0	Left in Place	1104029
LHB-C-S21	P	0-4	6/23/2011	16.2	19.8	Left in Place	1106206

Table 2: Confirmation Sample Results -- Leathers Hydroblast Pad

Sample I.D.	Type	Depth (in bgs)	Date	Arsenic (pulverized) (mg/kg)	Lead (pulverized) (mg/kg)	Soil Removed or Left in Place	Laboratory Report Number
Bottom Samples							
LHB-C-B1	P	0-4	4/22/2011	8.36	18.2	Left in Place	1104200
LHB-C-B2	P	0-4	4/22/2011	8.33	17.2	Left in Place	1104200
LHB-C-B3	P	0-4	4/22/2011	8.39	18.1	Left in Place	1104200
LHB-C-B4	P	0-4	4/22/2011	9.17	17.7	Left in Place	1104200
LHB-C-B5	P	0-4	4/22/2011	10.3	18.2	Left in Place	1104200
LHB-C-B6	P	0-4	4/22/2011	10.6	18.1	Left in Place	1104200
LHB-C-B7	P	0-4	4/22/2011	45.5	25.2	Removed	1104200
LHB-C-B7	P	4-8	4/22/2011	14.3	--	Left in Place	1104200A
LHB-C-B8	P	0-4	4/22/2011	10.7	18.9	Left in Place	1104200
LHB-C-B8	FD	0-4	4/22/2011	12.2	19.0	Left in Place	1104200
LHB-C-B9	P	0-4	4/22/2011	8.50	17.7	Left in Place	1104200
LHB-C-B10	P	0-4	4/22/2011	8.62	17.5	Left in Place	1104200
LHB-C-B11	P	0-4	5/6/2011	10.0	15.1	Left in Place	1105059
LHB-C-B12	P	0-4	5/6/2011	11.6	13.5	Left in Place	1105059
LHB-C-B13	P	0-4	5/6/2011	6.16	11.6	Left in Place	1105059
LHB-C-B14	P	0-4	5/6/2011	6.48	14.2	Left in Place	1105059

Notes:

(1) Soil sample type is primary (P) or field duplicate (FD).

(2) Soil samples were collected into 4-inch acetate sleeves by direct-push method. Sample depths are presented in units of inches below ground surface (in bgs). The 0-4 in bgs samples were collected from 0 to 4 inches bgs.

(3) All soil samples were "pulverized" by machine grinding at the laboratory prior to analysis.

(4) Soil sampling results are expressed in units of milligrams per kilogram (mg/kg). Where a compound was not detected at or above the laboratory reporting limit, a less-than sign (<) and the reporting limit are shown in the table.

Table 3a: Confirmation Sample Results -- Leathers Equipment Yard LEY-1

Sample I.D.	Type	Depth (in bgs)	Date	Arsenic (pulverized) (mg/kg)	Soil Removed or Left in Place	Laboratory Report Number
Sidewall Samples						
LEY1-C-S1	P	0-4	3/11/2011	11.3	Left in Place	1103142
LEY1-C-S2	P	0-4	3/11/2011	11.3	Left in Place	1103142
LEY1-C-S3	P	0-4	3/11/2011	13.4	Left in Place	1103142
LEY1-C-S3	FD	0-4	3/11/2011	14.1	Left in Place	1103142
LEY1-C-S4	P	0-4	3/11/2011	27.0	Left in Place; Significantly Close to 26.0	1103142
LEY1-C-S5	P	0-4	5/6/2011	41.0	Removed	1105058
LEY1-C-S5	P	4-8	5/6/2011	11.5	Left in Place	1105058A
LEY1-C-S6	P	0-4	3/11/2011	18.0	Left in Place	1103142
LEY1-C-S7	P	0-4	6/10/2011	11.8	Left in Place	1106094
LEY1-C-S8	P	0-4	6/10/2011	25.6	Left in Place	1106094
LEY1-C-S9	P	0-4	6/10/2011	9.11	Left in Place	1106094
Bottom Samples						
LEY1-C-B1	P	0-4	3/11/2011	8.88	Left in Place	1103142

Notes:

(1) Soil sample type is primary (P) or field duplicate (FD).

(2) Soil samples were collected into 4-inch acetate sleeves by direct-push method. Sample depths are presented in units of inches below ground surface (in bgs). The 0-4 in bgs samples were collected from 0 to 4 inches bgs.

(3) All soil samples were "pulverized" by machine grinding at the laboratory prior to analysis.

(4) Soil sampling results are expressed in units of milligrams per kilogram (mg/kg). Where a compound was not detected at or above the laboratory reporting limit, a less-than sign (<) and the reporting limit are shown in the table.

Table 3b: Confirmation Sample Results -- Leathers Equipment Yard LEY-3

Sample I.D.	Type	Depth (in bgs)	Date	Arsenic (pulverized) (mg/kg)	Soil Removed or Left in Place	Laboratory Report Number
Sidewall Samples						
LEY3-C-S1	P	0-4	2/25/2011	144	Removed	1102276
LEY3-C-S1	P	4-8	2/25/2011	27.1	Removed	1103092
LEY3-C-S1	P	8-12	2/25/2011	9.18	Left in Place	1103173
LEY3-C-S2	P	0-4	5/6/2011	19.4	Left in Place	1105058
LEY3-C-S2	FD	0-4	5/6/2011	18.7	Left in Place	1105058
LEY3-C-S3	P	0-4	3/11/2011	20.6	Left in Place	1103142
LEY3-C-S4	P	0-4	2/25/2011	23.6	Left in Place	1102276
LEY3-C-S5	P	0-4	3/22/2011	9.98	Left in Place	1103268
LEY3-C-S6	P	0-4	4/1/2011	33.8	Removed	1104028
LEY3-C-S6	P	4-8	4/1/2011	9.01	Left in Place	1104219
LEY3-C-S6	FD	0-4	4/1/2011	16.6	Removed	1104028
LEY3-C-S6	FD	4-8	4/1/2011	9.43	Left in Place	1104219
LEY3-C-S7	P	0-4	4/1/2011	49.3	Removed	1104028
LEY3-C-S7	P	4-8	4/1/2011	10.3	Left in Place	1104219
LEY3-C-S8	P	0-4	5/6/2011	38.5	Removed	1105058
LEY3-C-S8	P	4-8	5/6/2011	8.88	Left in Place	1105058A
LEY3-C-S9	P	0-4	5/6/2011	22.3	Left in Place	1105058
LEY3-C-S10	P	0-4	6/10/2011	11.4	Left in Place	1106094
LEY3-C-S11	P	0-4	6/10/2011	21.9	Left in Place	1106094
LEY3-C-S12	P	0-4	6/10/2011	8.78	Left in Place	1106094
Bottom Samples						
LEY3-C-B1	P	0-4	2/25/2011	9.97	Left in Place	1102276
LEY3-C-B2	P	0-4	3/11/2011	8.73	Left in Place	1103142
LEY3-C-B3	P	0-4	3/11/2011	9.38	Left in Place	1103142
LEY3-C-B3	FD	0-4	3/11/2011	8.86	Left in Place	1103142

Table 3b: Confirmation Sample Results -- Leathers Equipment Yard LEY-3

Sample I.D.	Type	Depth (in bgs)	Date	Arsenic (pulverized) (mg/kg)	Soil Removed or Left in Place	Laboratory Report Number

Notes:

(1) Soil sample type is primary (P) or field duplicate (FD).

(2) Soil samples were collected into 4-inch acetate sleeves by direct-push method. Sample depths are presented in units of inches below ground surface (in bgs). The 0-4 in bgs samples were collected from 0 to 4 inches bgs.

(3) All soil samples were "pulverized" by machine grinding at the laboratory prior to analysis.

(4) Soil sampling results are expressed in units of milligrams per kilogram (mg/kg). Where a compound was not detected at or above the laboratory reporting limit, a less-than sign (<) and the reporting limit are shown in the table.

Table 3c: Confirmation Sample Results -- Leathers Equipment Yard LEY-5

Sample I.D.	Type	Depth (in bgs)	Date	Arsenic (pulverized) (mg/kg)	Soil Removed or Left in Place	Laboratory Report Number
Sidewall Samples						
LEY5-C-S1	P	0-4	2/25/2011	9.79	Left in Place	1102276
LEY5-C-S2	P	0-4	2/25/2011	58.0	Removed	1102276
LEY5-C-S2	P	4-8	2/25/2011	69.0	Removed	1103092
LEY5-C-S2	P	8-12	2/25/2011	18.1	Left in Place	1103173
LEY5-C-S3	P	0-4	2/25/2011	30.5	Removed	1102276
LEY5-C-S3	P	4-8	2/25/2011	9.42	Left in Place	1103092
LEY5-C-S4	P	0-4	3/11/2011	9.23	Left in Place	1103142
LEY5-C-S5	P	0-4	5/6/2011	41.3	Removed	1105058
LEY5-C-S5	P	4-8	5/6/2011	14.2	Left in Place	1105058A
LEY5-C-S6	P	0-4	3/11/2011	8.98	Left in Place	1103142
Bottom Samples						
LEY5-C-B1	P	0-4	2/25/2011	10.6	Left in Place	1102276
LEY5-C-B2	P	0-4	3/11/2011	9.23	Left in Place	1103142

Notes:

(1) Soil sample type is primary (P) or field duplicate (FD).

(2) Soil samples were collected into 4-inch acetate sleeves by direct-push method. Sample depths are presented in units of inches below ground surface (in bgs). The 0-4 in bgs samples were collected from 0 to 4 inches bgs.

(3) All soil samples were "pulverized" by machine grinding at the laboratory prior to analysis.

(4) Soil sampling results are expressed in units of milligrams per kilogram (mg/kg). Where a compound was not detected at or above the laboratory reporting limit, a less-than sign (<) and the reporting limit are shown in the table.

Table 3d: Confirmation Sample Results -- Leathers Equipment Yard LEY-10

Sample I.D.	Type	Depth (in bgs)	Date	Arsenic (pulverized) (mg/kg)	Soil Removed or Left in Place	Laboratory Report Number
Sidewall Samples						
LEY10-C-S1	P	0-4	3/11/2011	9.56	Left in Place	1103142
LEY10-C-S2	P	0-4	3/11/2011	10.8	Left in Place	1103142
LEY10-C-S3	P	0-4	3/22/2011	57.5	Removed	1103268
LEY10-C-S3	P	4-8	3/22/2011	11.7	Left in Place	1104219
LEY10-C-S3	FD	0-4	3/22/2011	8.88	Removed	1103268
LEY10-C-S3	FD	4-8	3/22/2011	8.79	Left in Place	1104219
LEY10-C-S4	P	0-4	4/1/2011	11.6	Left in Place	1104028
LEY10-C-S5	P	0-4	4/1/2011	10.7	Left in Place	1104028
LEY10-C-S6	P	0-4	3/22/2011	10.6	Left in Place	1103268
LEY10-C-S7	P	0-4	3/11/2011	10.3	Left in Place	1103142
LEY10-C-S8	P	0-4	3/11/2011	10.2	Left in Place	1103142
LEY10-C-S9	P	0-4	4/22/2011	11.7	Left in Place	1104203
LEY10-C-S10	P	0-4	5/6/2011	35.6	Removed	1105058
LEY10-C-S10	P	4-8	5/6/2011	10.0	Left in Place	1105058A
LEY10-C-S11	P	0-4	6/10/2011	19.4	Left in Place	1106094
LEY10-C-S12	P	0-4	6/10/2011	9.47	Left in Place	1106094
LEY10-C-S13	P	0-4	6/10/2011	14.4	Left in Place	1106094
Bottom Samples						
LEY10-C-B1	P	0-4	3/11/2011	8.81	Left in Place	1103142

Notes:

(1) Soil sample type is primary (P) or field duplicate (FD).

(2) Soil samples were collected into 4-inch acetate sleeves by direct-push method. Sample depths are presented in units of inches below ground surface (in bgs). The 0-4 in bgs samples were collected from 0 to 4 inches bgs.

(3) All soil samples were "pulverized" by machine grinding at the laboratory prior to analysis.

(4) Soil sampling results are expressed in units of milligrams per kilogram (mg/kg). Where a compound was not detected at or above the laboratory reporting limit, a less-than sign (<) and the reporting limit are shown in the table.

Table 4: Confirmation Sample Results -- Central Services Hydroblast Pad

Sample I.D.	Type	Depth (in bgs)	Date	Arsenic (pulverized) (mg/kg)	Soil Removed or Left in Place	Laboratory Report Number
Sidewall Samples						
CS-C-S1	P	0-4	4/1/2011	7.39	Left in Place	1104026
CS-C-S2	P	0-4	4/1/2011	6.73	Left in Place	1104026
CS-C-S3	P	0-4	4/1/2011	11.7	Left in Place	1104026
CS-C-S4	P	0-4	4/1/2011	7.06	Left in Place	1104026
CS-C-S5	P	0-4	4/1/2011	35.5	Removed	1104026
CS-C-S5	P	4-8	4/1/2011	12.8	Left in Place	1104219
CS-C-S6	P	0-4	4/1/2011	30.0	Removed	1104026
CS-C-S6	P	4-8	4/1/2011	18.5	Left in Place	1104219
CS-C-S7	P	0-4	4/1/2011	12.1	Left in Place	1104026
CS-C-S7	FD	0-4	4/1/2011	11.6	Left in Place	1104026
CS-C-S8	P	0-4	4/1/2011	9.53	Left in Place	1104026
CS-C-S9	P	0-4	4/1/2011	38.0	Removed	1104026
CS-C-S9	P	4-8	4/1/2011	6.86	Left in Place	1104219
CS-C-S10	P	0-4	4/1/2011	7.80	Left in Place	1104026
CS-C-S11	P	0-4	5/6/2011	21.3	Left in Place	1105057
CS-C-S12	P	0-4	5/6/2011	13.1	Left in Place	1105057
CS-C-S13	P	0-4	5/6/2011	11.3	Left in Place	1105057
Bottom Samples						
CS-C-B1	P	0-4	4/1/2011	6.74	Left in Place	1104026
CS-C-B2	P	0-4	4/1/2011	18.1	Left in Place	1104026
CS-C-B3	P	0-4	4/1/2011	7.54	Left in Place	1104026

Notes:

(1) Soil sample type is primary (P) or field duplicate (FD).

(2) Soil samples were collected into 4-inch acetate sleeves by direct-push method. Sample depths are presented in units of inches below ground surface (in bgs). The 0-4 in bgs samples were collected from 0 to 4 inches bgs.

(3) All soil samples were "pulverized" by machine grinding at the laboratory prior to analysis.

(4) Soil sampling results are expressed in units of milligrams per kilogram (mg/kg). Where a compound was not detected at or above the laboratory reporting limit, a less-than sign (<) and the reporting limit are shown in the table.

Table 5: Confirmation Sample Results -- Elmore Zinc Recovery and Surface Impoundment

Sample I.D.	Type	Depth (in bgs)	Date	Arsenic (pulverized) (mg/kg)	Soil Removed or Left in Place	Laboratory Report Number
Sidewall Samples						
ELM-C-S1	P	0-4	4/1/2011	6.33	Left in Place	1104030
Bottom Samples						
ELM-C-B1	P	0-4	4/1/2011	7.53	Left in Place	1104030
ELM-C-B2	P	0-4	4/1/2011	6.61	Left in Place	1104030
ELM-C-B3	P	0-4	4/1/2011	7.05	Left in Place	1104030

Notes:

(1) Soil sample type is primary (P) or field duplicate (FD).

(2) Soil samples were collected into 4-inch acetate sleeves by direct-push method. Sample depths are presented in units of inches below ground surface (in bgs). The 0-4 in bgs samples were collected from 0 to 4 inches bgs.

(3) All soil samples were "pulverized" by machine grinding at the laboratory prior to analysis.

(4) Soil sampling results are expressed in units of milligrams per kilogram (mg/kg). Where a compound was not detected at or above the laboratory reporting limit, a less-than sign (<) and the reporting limit are shown in the table.

Table 6: Confirmation Sample Results -- Hoch Hydroblast Pad and Surface Impoundment

Sample I.D.	Type	Depth (in bgs)	Date	Arsenic (pulverized) (mg/kg)	Soil Removed or Left in Place	Laboratory Report Number
Sidewall Samples						
H-C-S1	P	0-4	4/22/2011	37.5	Removed	1104201
H-C-S1	P	4-8	4/22/2011	16.7	Left in Place	1104201A
H-C-S2	P	0-4	4/22/2011	45.6	Removed	1104201
H-C-S2	P	4-8	4/22/2011	282	Left in Place -- Area of Geocrete	1104201A
H-C-S2	P	8-12	4/22/2011	124	Left in Place -- Area of Geocrete	1105062
H-C-S3	P	0-4	5/6/2011	31.2	Left in Place -- Area of Geocrete	1105060
H-C-S4	P	0-4	5/6/2011	40.9	Left in Place -- Area of Geocrete	1105060
H-C-S4	FD	0-4	5/6/2011	4.32	Left in Place	1105060
Bottom Samples						
H-C-B1	P	0-4	4/22/2011	7.92	Left in Place	1104201
H-C-B1	FD	0-4	4/22/2011	9.23	Left in Place	1104201
H-C-B2	P	0-4	4/22/2011	19.1	Left in Place	1104201

Notes:

(1) Soil sample type is primary (P) or field duplicate (FD).

(2) Soil samples were collected into 4-inch acetate sleeves by direct-push method. Sample depths are presented in units of inches below ground surface (in bgs). The 0-4 in bgs samples were collected from 0 to 4 inches bgs.

(3) All soil samples were "pulverized" by machine grinding at the laboratory prior to analysis.

(4) Soil sampling results are expressed in units of milligrams per kilogram (mg/kg). Where a compound was not detected at or above the laboratory reporting limit, a less-than sign (<) and the reporting limit are shown in the table.

Table 7: Confirmation Sample Results -- Units 1 and 2 Hydroblast Pad

Sample I.D.	Type	Depth (in bgs)	Date	Arsenic (pulverized) (mg/kg)	Soil Removed or Left in Place	Laboratory Report Number
Sidewall Samples						
U1-C-S1	P	0-4	2/25/2011	32.8	Removed	1102277
U1-C-S1	P	4-8	2/25/2011	16.7	Left in Place	1103092
U1-C-S1	FD	0-4	2/25/2011	38.5	Removed	1102277
U1-C-S1	FD	4-8	2/25/2011	22.5	Left in Place	1103092
U1-C-S2	P	0-4	2/25/2011	19.7	Left in Place	1102277
U1-C-S3	P	0-4	2/25/2011	28.9	Left in Place; Obstruction	1102277
U1-C-S3	P	4-8	2/25/2011	26.9	Left in Place; Obstruction	1103092
U1-C-S3	P	8-12	2/25/2011	5.23	Left in Place	1103173
U1-C-S4	P	0-4	2/25/2011	18.0	Left in Place	1102277
U1-C-S5	P	0-4	3/11/2011	24.1	Left in Place	1103131
U1-C-S6	P	0-4	2/25/2011	8.62	Left in Place	1102277
U1-C-S7	P	0-4	2/25/2011	35.8	Removed	1102277
U1-C-S7	P	4-8	2/25/2011	6.50	Left in Place	1103092
U1-C-S8	P	0-4	2/25/2011	17.1	Left in Place	1102277
U1-C-S8	FD	0-4	2/25/2011	23.2	Left in Place	1102277
U1-C-S9	P	0-4	4/1/2011	11.9	Left in Place	1104031
U1-C-S10	P	0-4	2/25/2011	41.5	Removed	1102277
U1-C-S10	P	4-8	2/25/2011	21.1	Left in Place	1103092
U1-C-S11	P	0-4	2/25/2011	17.4	Left in Place	1102277
U1-C-S12	P	0-4	4/1/2011	18.6	Left in Place	1104031
U1-C-S13	P	0-4	4/1/2011	5.80	Left in Place	1104031
U1-C-S13	FD	0-4	4/1/2011	6.80	Left in Place	1104031
U1-C-S14	P	0-4	4/1/2011	10.6	Left in Place	1104031
Bottom Samples						
U1-C-B1	P	0-4	2/25/2011	6.18	Left in Place	1102277
U1-C-B2	P	0-4	2/25/2011	6.54	Left in Place	1102277
U1-C-B3	P	0-4	2/25/2011	2.71	Left in Place	1102277

Table 7: Confirmation Sample Results -- Units 1 and 2 Hydroblast Pad

Sample I.D.	Type	Depth (in bgs)	Date	Arsenic (pulverized) (mg/kg)	Soil Removed or Left in Place	Laboratory Report Number

Notes:

(1) Soil sample type is primary (P) or field duplicate (FD).

(2) Soil samples were collected into 4-inch acetate sleeves by direct-push method. Sample depths are presented in units of inches below ground surface (in bgs). The 0-4 in bgs samples were collected from 0 to 4 inches bgs.

(3) All soil samples were "pulverized" by machine grinding at the laboratory prior to analysis.

(4) Soil sampling results are expressed in units of milligrams per kilogram (mg/kg). Where a compound was not detected at or above the laboratory reporting limit, a less-than sign (<) and the reporting limit are shown in the table.

Table 8: Confirmation Sample Results -- Units 3 and 4 Hydroblast Pad

Sample I.D.	Type	Depth (in bgs)	Date	Arsenic (pulverized) (mg/kg)	Soil Removed or Left in Place	Laboratory Report Number
Bottom Samples						
U3-C-B1	P	0-4	3/22/2011	7.32	Left in Place	1103267

Notes:

(1) Soil sample type is primary (P) or field duplicate (FD).

(2) Soil samples were collected into 4-inch acetate sleeves by direct-push method. Sample depths are presented in units of inches below ground surface (in bgs). The 0-4 in bgs samples were collected from 0 to 4 inches bgs.

(3) All soil samples were "pulverized" by machine grinding at the laboratory prior to analysis.

(4) Soil sampling results are expressed in units of milligrams per kilogram (mg/kg). Where a compound was not detected at or above the laboratory reporting limit, a less-than sign (<) and the reporting limit are shown in the table.

Table 9: Volume of Soil Disposed as Non-hazardous

Source	Destination	Volume (tons)	Date Removal Completed
Leathers			
Surface Impoundment	DVC	580	5/4/2011
Hydroblast Pad	DVC	3,708	8/5/2011
Equipment Yard	DVC	3,548	8/8/2011
Total		7,836	
Central Services			
Total	DVC	1,610	6/20/2011
Elmore			
Total	DVC	495	5/14/2011
Hoch			
Total	DVC	404	7/23/2011
Region 1			
Unit 1	DVC	783	5/20/2011
Unit 3	DVC	82	5/14/2011
Total		865	
Total		11,210	

Notes:

(1) DVC is the Desert Valley Company Monofill, Brawley, California.

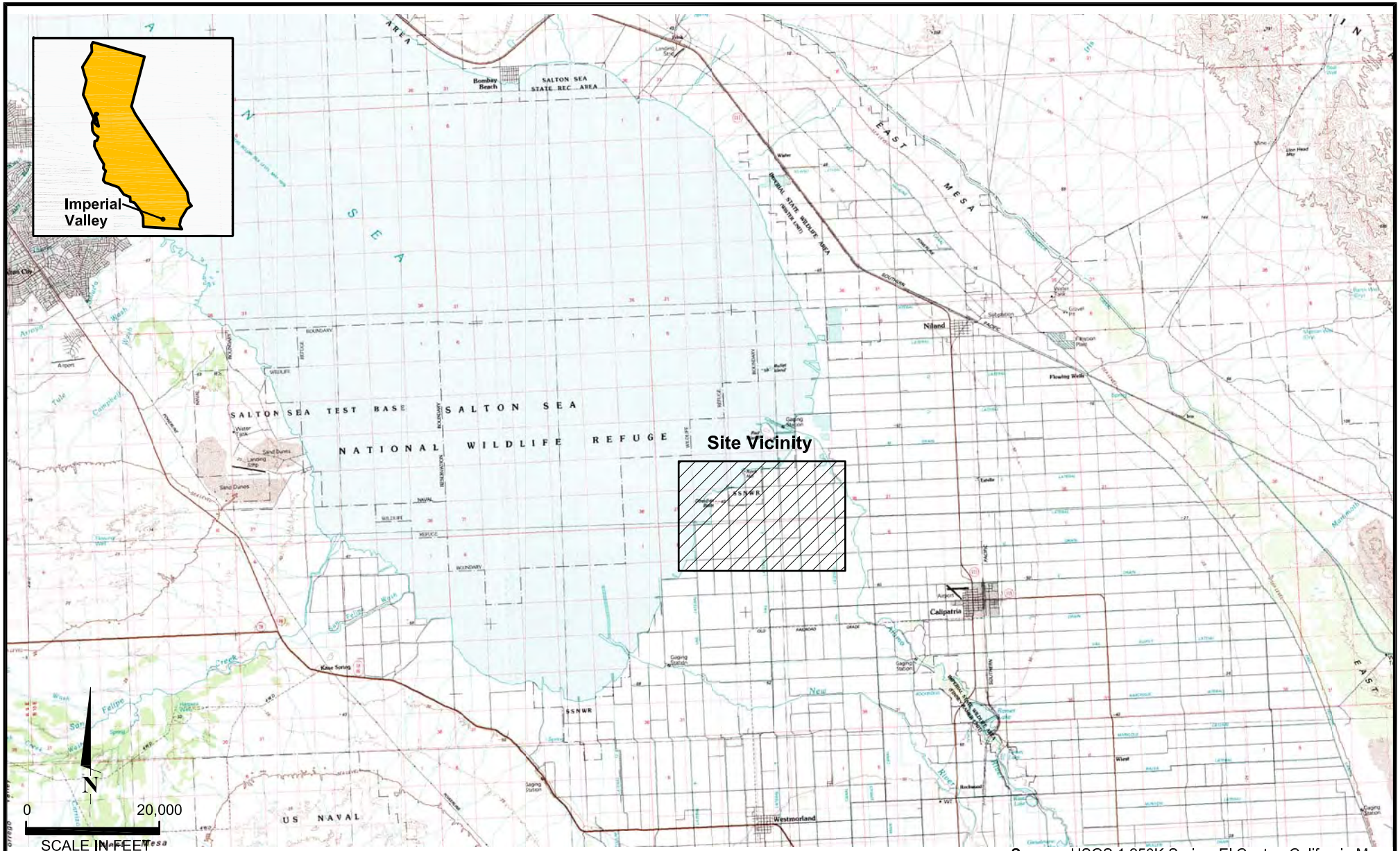
Table 10: Volume of Soil Disposed as Hazardous

Source	Destination	Volume (cubic yards)	Date Removed
Leathers Hydroblast Pad	Kettleman	18	2/16/2011
Leathers Hydroblast Pad	Kettleman	18	2/16/2011
Leathers Hydroblast Pad	Kettleman	18	2/16/2011
Leathers Hydroblast Pad	Kettleman	18	2/16/2011
Leathers Hydroblast Pad	Kettleman	18	2/21/2011
Leathers Hydroblast Pad	Kettleman	18	2/21/2011
Leathers Hydroblast Pad	Kettleman	18	2/21/2011
Leathers Hydroblast Pad	Kettleman	20	3/14/2011
Leathers Hydroblast Pad	Kettleman	20	5/3/2011
Leathers Equipment Yard	Kettleman	18	2/21/2011
Leathers Equipment Yard	Kettleman	18	2/21/2011
Leathers LW Stockpile	Kettleman	20	7/28/2011
Leathers LW Stockpile	Kettleman	20	7/28/2011
Leathers LW Stockpile	Kettleman	20	7/28/2011
Leathers LW Stockpile	Kettleman	20	7/28/2011
Unit 3 Hydroblast Pad	Kettleman	20	5/3/2011
Unit 3 Hydroblast Pad	Kettleman	20	5/5/2011
Unit 3 Hydroblast Pad	Kettleman	18	5/6/2011
Total		340	

Notes:

(1) Kettleman is Waste Management Incorporated Kettleman Hills Landfill, 35251 Old Skyline Road, Kettleman City, California 93239.

Figures



Source: USGS 1:250K Series, El Centro, California Map

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Site Vicinity Map
CalEnergy Geothermal Power Plants
Imperial Valley, California

Figure
1

Drafter: EC | Date: 08/30/11 | Contract Number: 07-485A

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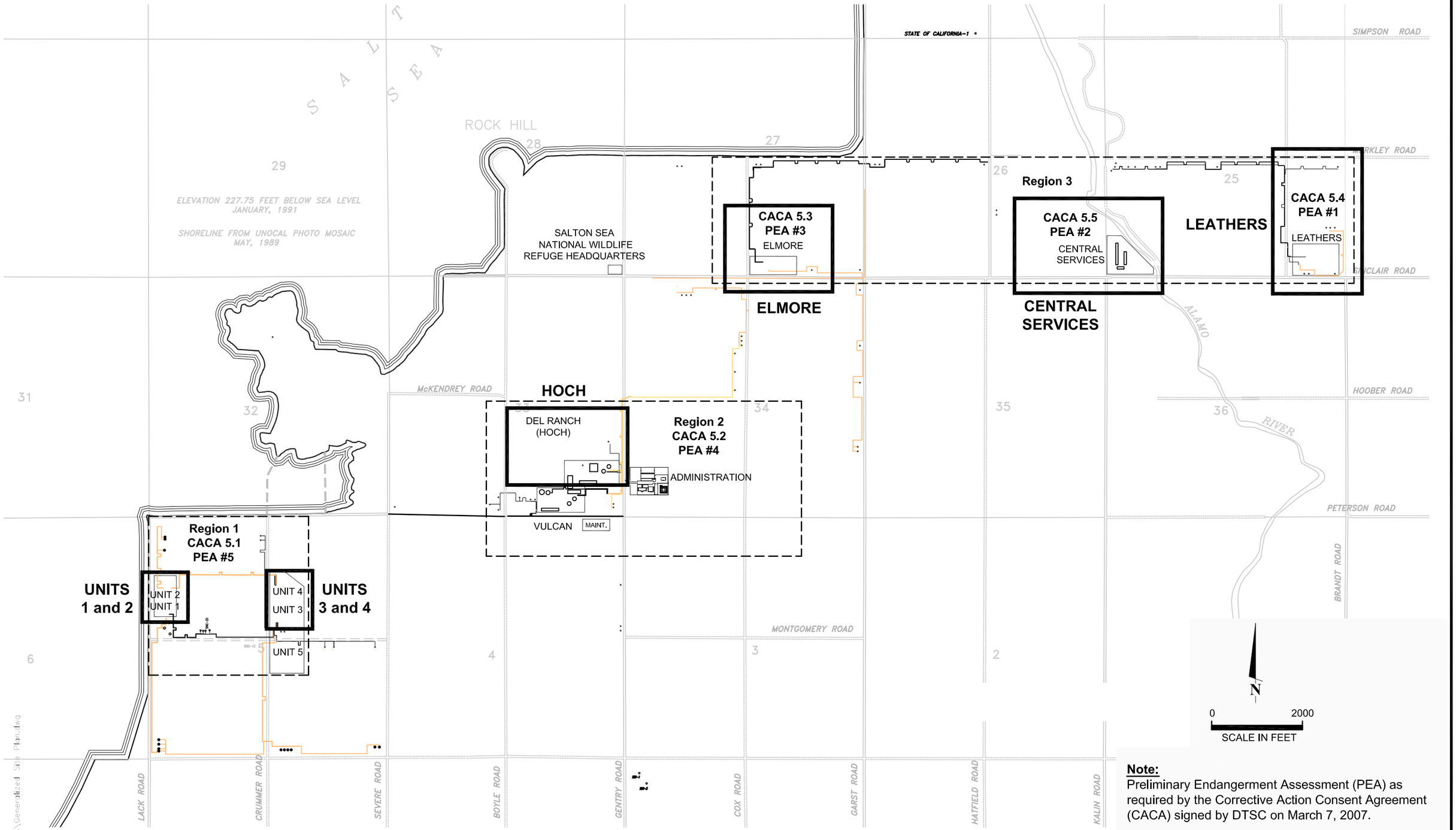

Note:
Preliminary Endangerment Assessment (PEA) as required by the Corrective Action Consent Agreement (CACA) signed by DTSC on March 7, 2007.

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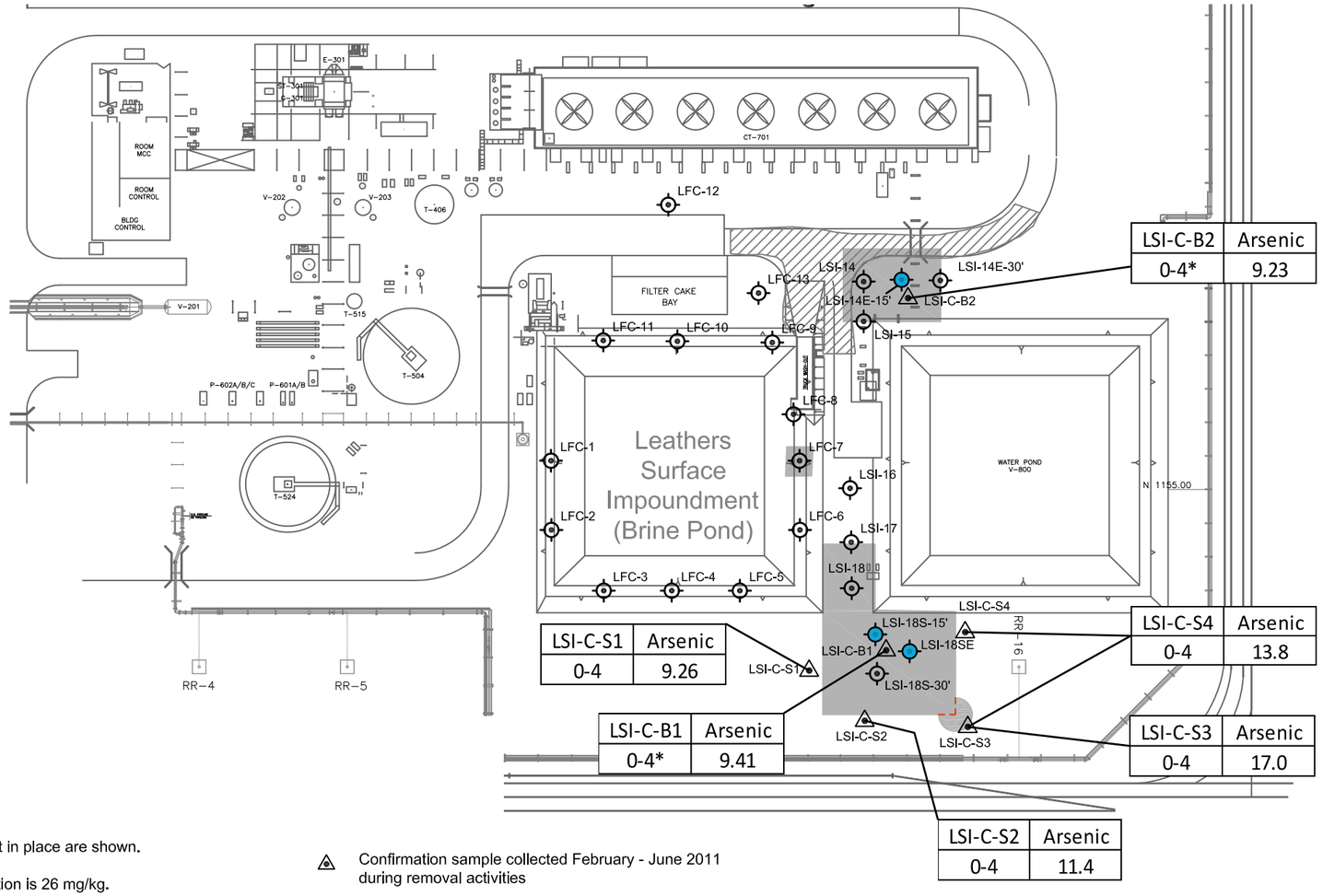
General Site Plan
CalEnergy Geothermal Power Plants
Imperial Valley, California

Figure
2

Drafter: EC
Date: 09/22/11
Contract Number: 07-485A



EXPLANATION:

Only arsenic sample results left in place are shown.

Background arsenic concentration is 26 mg/kg.

Sample Name	Analyte
Depth (inches)	Result (mg/kg)

Sample Name:

LSI Leathers surface impoundment
C Confirmation sample
-S Sidewall sample, depth measured in inches from initial ground surface.
-B Bottom sample. Locations of (B) bottom samples were selected after lateral extent of excavation was completed.
* Depth of bottom samples measured from base of excavation.
^ Sample initially collected as a sidewall sample, but became a bottom sample after excavation extension.

Confirmation sample collected February - June 2011 during removal activities

Initally proposed area to be addressed

Area removed to 5 inch depth

Impediment to scraping (concrete, asphalt, etc.)

PEA sampling point with arsenic less than background concentrations

PEA sampling point with arsenic greater than background concentrations at 0.3"

PEA soil samples collected in June 2007 and March 2008.

Concentrations are in mg/kg (milligrams per kilogram).

Prevailing Wind Direction

N

0 125

SCALE IN FEET

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Leathers Surface Impoundment and Filter Cake Bay Area - Removal Area and Confirmation Sample Results
CalEnergy Geothermal Power Plant
Imperial Valley, California

Figure **3**

Drafter: EC Date: 08/30/11 Contract Number: 07-485A

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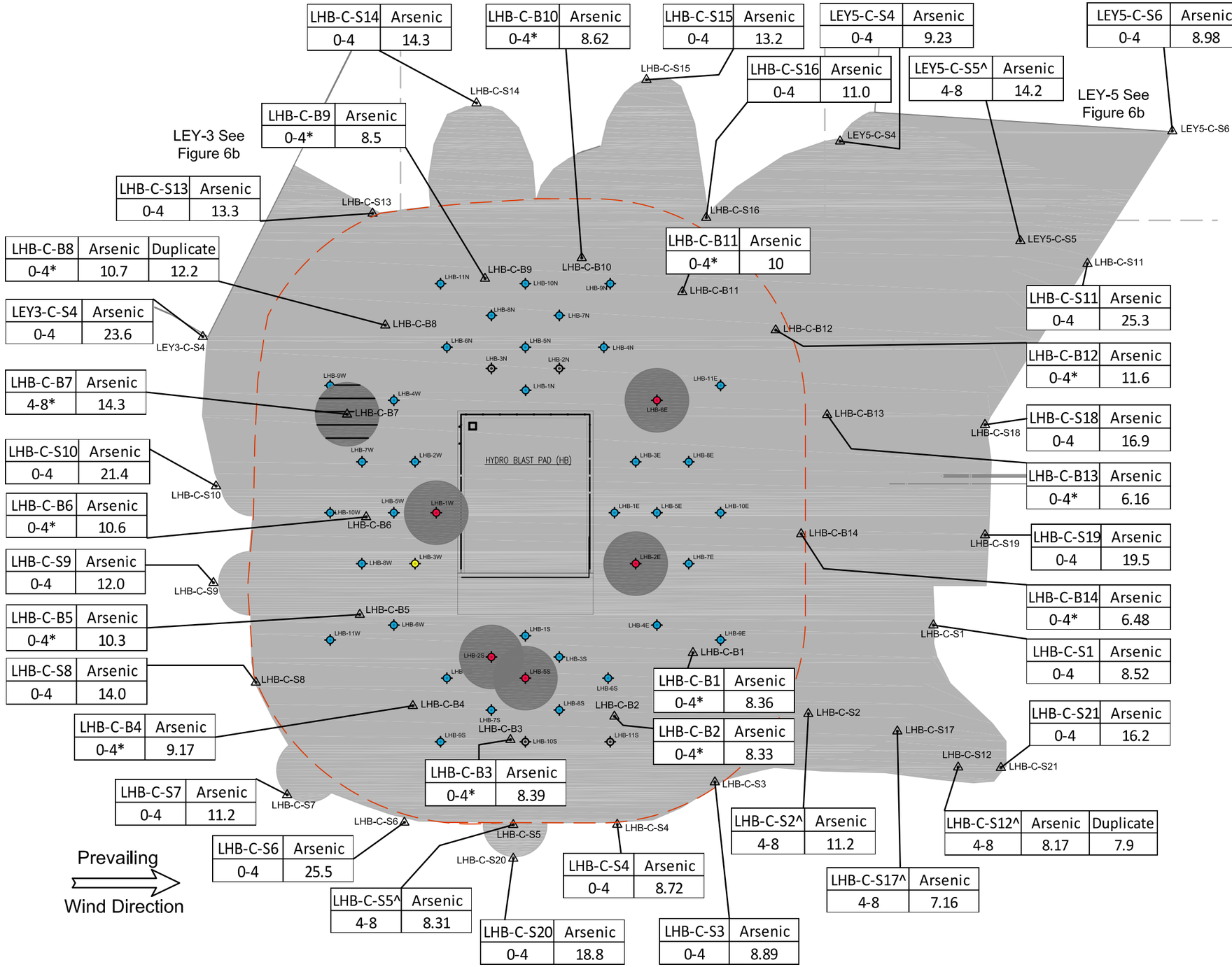

EXPLANATION:

Only arsenic sample results left in place are shown.

Background arsenic concentration is 26 mg/kg.

Sample Name	Analyte
Depth (inches)	Result (mg/kg)

Sample Name:

LHB Leathers hydroblast pad
LEY Leathers equipment yard
C Confirmation sample
-S Sidewall sample, depth measured in inches from initial ground surface.
-B Bottom sample. Locations of (B) bottom samples were selected after lateral extent of excavation was completed.
* Depth of bottom samples measured from base of excavation.
^ Sample initially collected as a sidewall sample, but became a bottom sample after excavation extension.

Confirmation sample collected February - June 2011 during removal activities

Initally proposed area to be addressed

Area removed to 5 inch depth

Area removed to 9 inch depth

Area scraped to 13 inch depth

PEA sampling point with arsenic less than background concentrations

PEA sampling point with arsenic greater than background concentrations at 0.3"

PEA sampling point with arsenic greater than background concentrations at 0.3' and with lead greater than 320 mg/kg at 0.3'

PEA sampling point with arsenic greater than background concentrations at 0.3' and 1'

PEA soil samples collected in June 2007 and March 2008.

Concentrations are in mg/kg (milligrams per kilogram).

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Leathers Hydroblast Pad – Removal Area and Confirmation Sample Results - Arsenic
CalEnergy Geothermal Power Plant
Imperial Valley, California

Figure **4a**

Drafter: EC | Date: 08/30/11 | Contract Number: 07-485A

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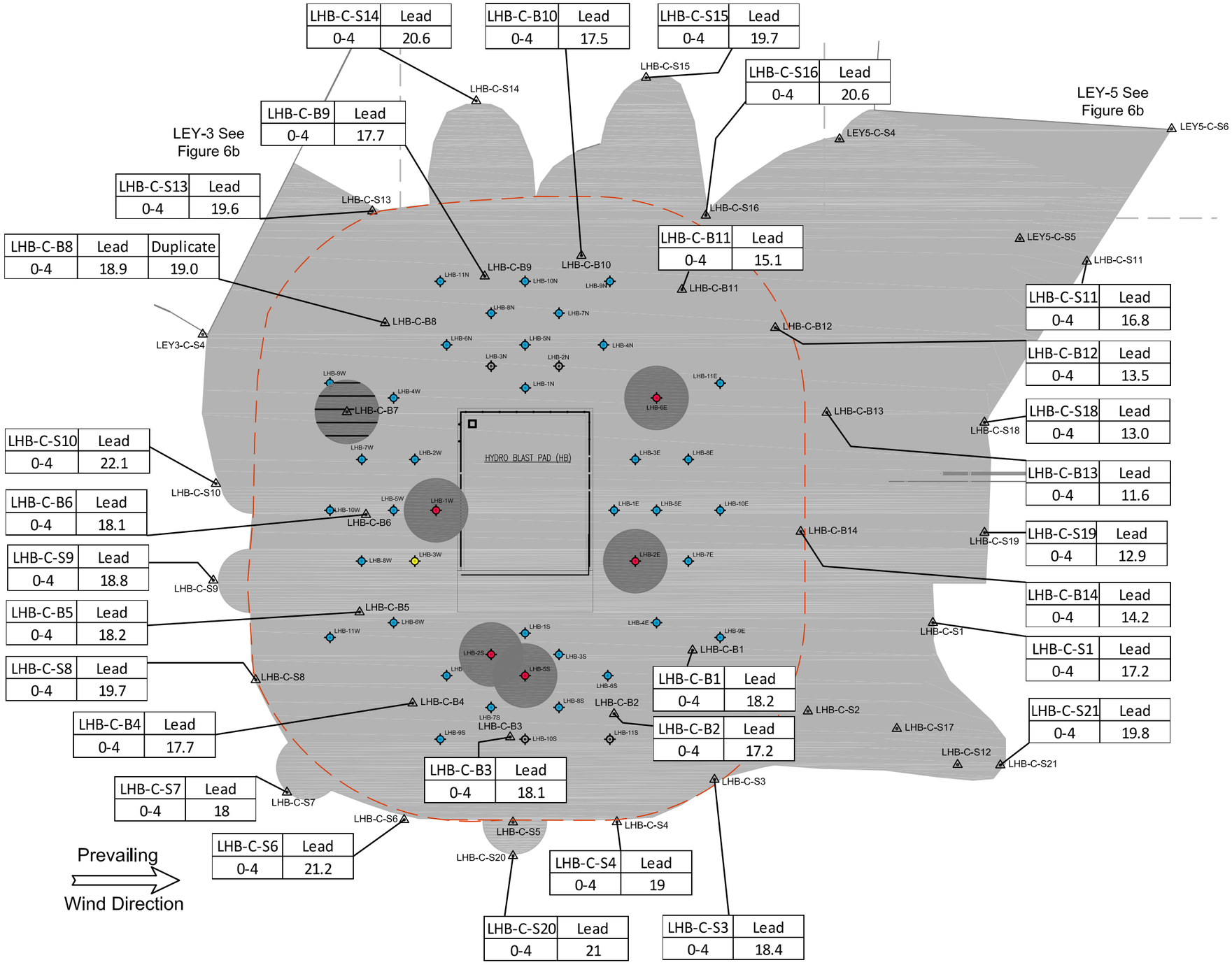

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Leathers Hydroblast Pad - Removal Area and Confirmation Sample Results - Lead
CalEnergy Geothermal Power Plant
Imperial Valley, California

Figure
4b

Drafter: EC
Date: 08/30/11
Contract Number: 07-485A

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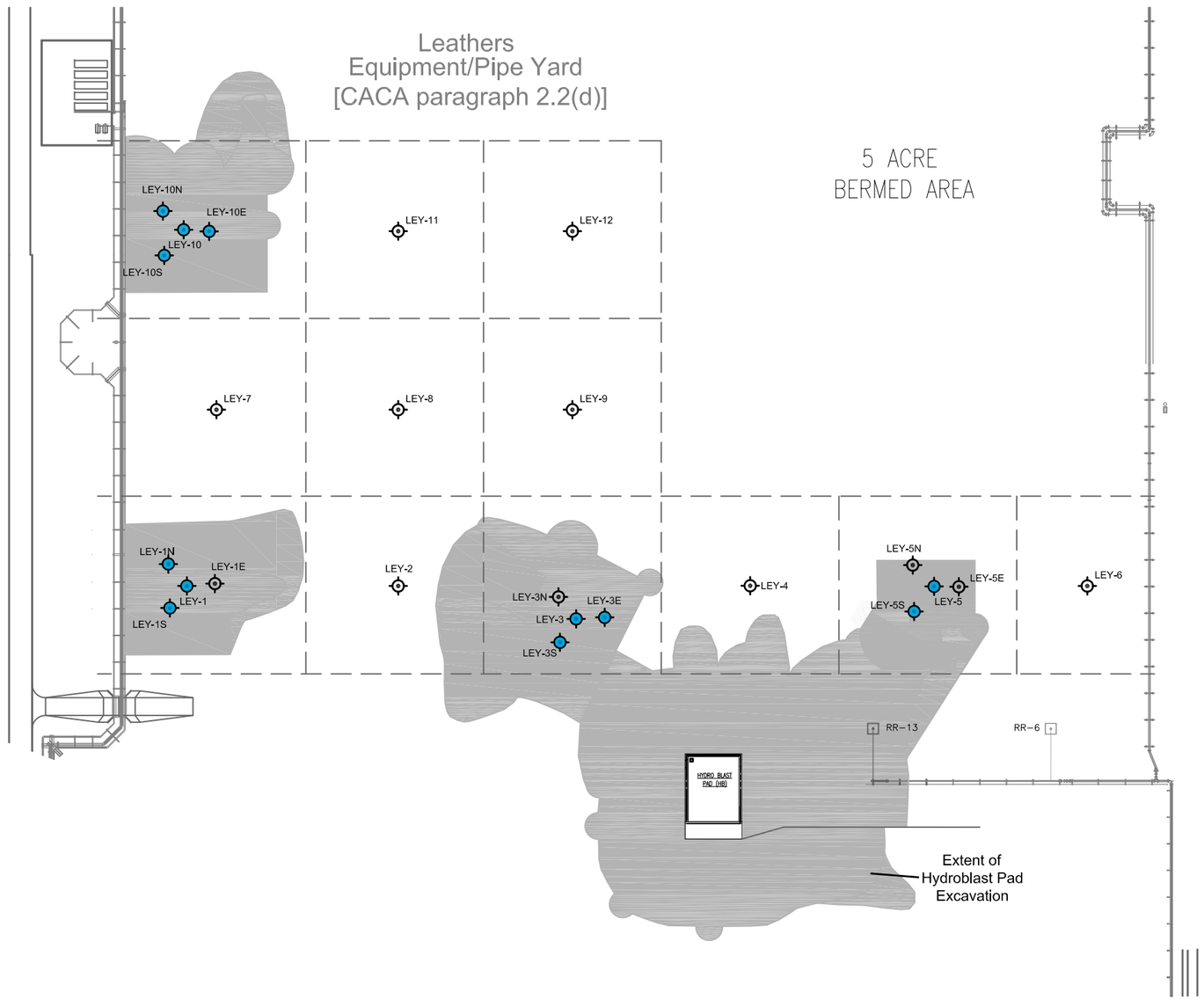
N

0 150

SCALE IN FEET

Prevailing Wind Direction



EXPLANATION:

Area scraped to at least 5 inches

PEA soil samples collected in June 2007 and March 2008:

Sampling point with arsenic less than background concentrations

Sampling point with arsenic greater than background concentrations at 0.3"

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Leathers Equipment Yard - Overview of Removal Areas
CalEnergy Geothermal Power Plant
Imperial Valley, California

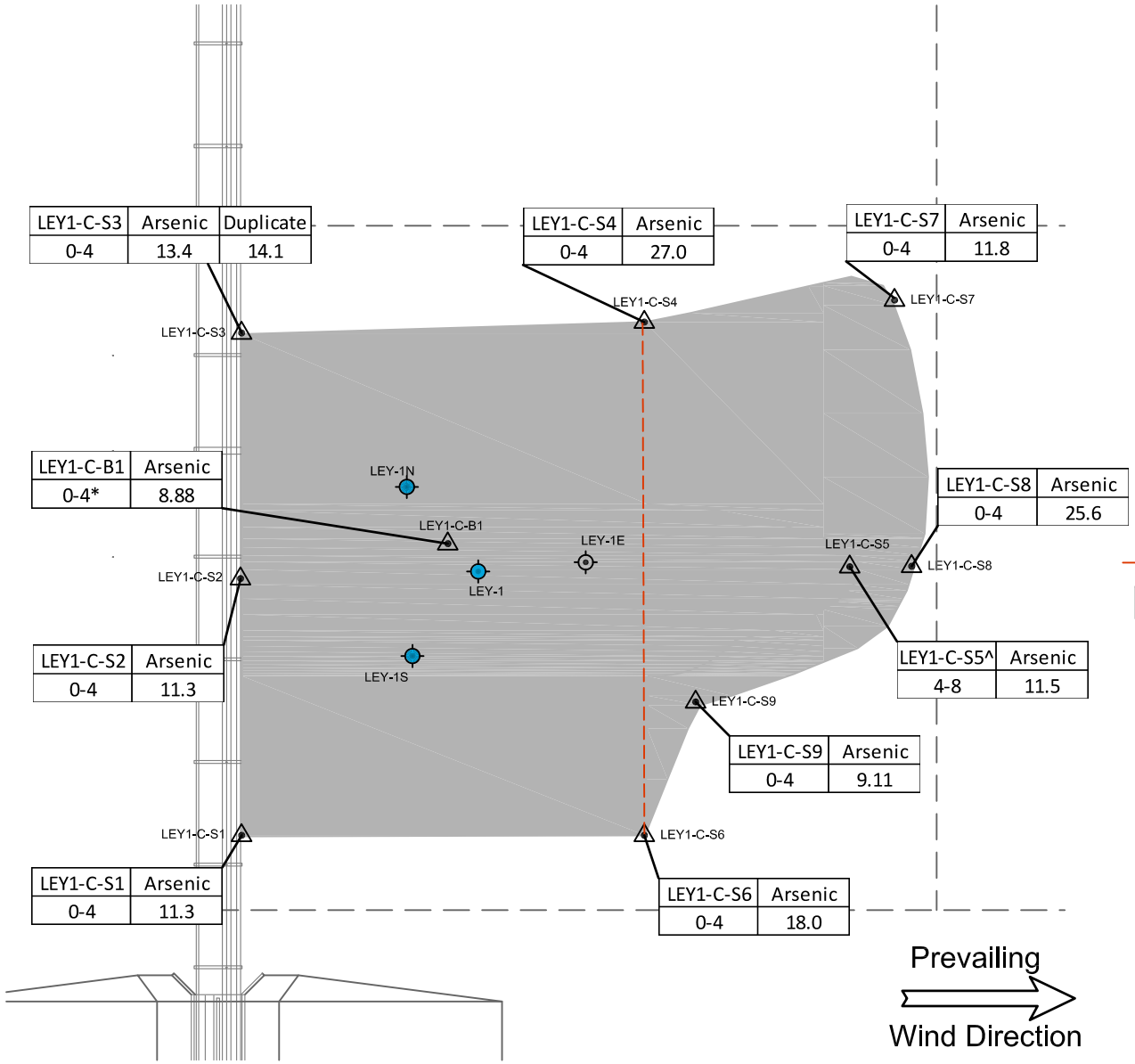
Figure **5a**

Drafter: EC

Date: 08/30/11

Contract Number: 07-485A

I:\CAD\07\07-485-A\Leathers confirmation.dwg



EXPLANATION:

Only arsenic sample results left in place are shown.

Background arsenic concentration is 26 mg/kg.

Sample Name	Analyte
Depth (inches)	Result (mg/kg)

Sample Name:

LEY Leathers equipment yard
C Confirmation sample
-S Sidewall sample, depth measured in inches from initial ground surface.
-B Bottom sample. Locations of (B) bottom samples were selected after lateral extent of excavation was completed.
* Depth of bottom samples measured from base of excavation.
^ Sample initially collected as a sidewall sample, but became a bottom sample after excavation extension.

Confirmation sample collected February - June 2011 during removal activities

Initally proposed area to be addressed

Area removed to 5 inch depth

PEA sampling point with arsenic less than background concentrations

PEA sampling point with arsenic greater than background concentrations at 0.3"

PEA soil samples collected in June 2007 and March 2008.

Concentrations are in mg/kg (milligrams per kilogram).

N

0 50

SCALE IN FEET

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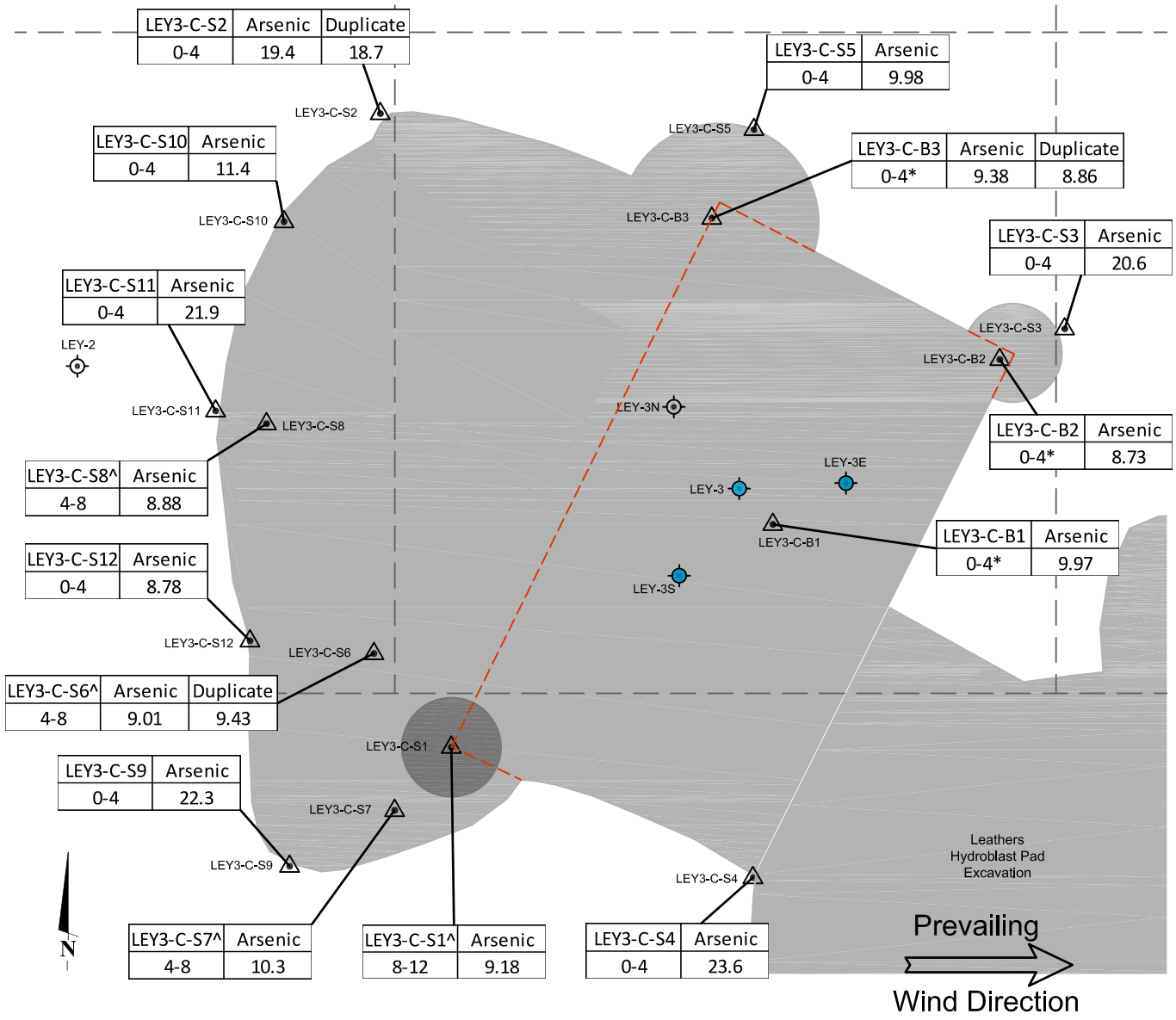
Leathers Equipment Yard - LEY-1: Removal Area and Confirmation Sample Results
CalEnergy Geothermal Power Plant
Imperial Valley, California

Figure
5b

Drafter: EC | Date: 07/22/11 | Contract Number: 07-485A

I:\CAD\07\07-485-A\Leathers confirmation.dwg



EXPLANATION:

Only arsenic sample results left in place are shown.

Background arsenic concentration is 26 mg/kg.

Sample Name	Analyte
Depth (inches)	Result (mg/kg)

Sample Name:

LEY Leathers equipment yard
C Confirmation sample
-S Sidewall sample, depth measured in inches from initial ground surface.
-B Bottom sample. Locations of (B) bottom samples were selected after lateral extent of excavation was completed.
* Depth of bottom samples measured from base of excavation.
^ Sample initially collected as a sidewall sample, but became a bottom sample after excavation extension.

△ Confirmation sample collected February - June 2011 during removal activities

Initally proposed area to be addressed

Area removed to 5 inch depth

Area removed to 9 inch depth

PEA sampling point with arsenic less than background concentrations

PEA sampling point with arsenic greater than background concentrations at 0.3"

PEA soil samples collected in June 2007 and March 2008.

Concentrations are in mg/kg (milligrams per kilogram).

0 50
SCALE IN FEET

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Leathers Equipment Yard - LEY-3: Removal Area and Confirmation Sample Results
CalEnergy Geothermal Power Plant
Imperial Valley, California

Figure
5c

Drafter: EC | Date: 08/30/11 | Contract Number: 07-485A

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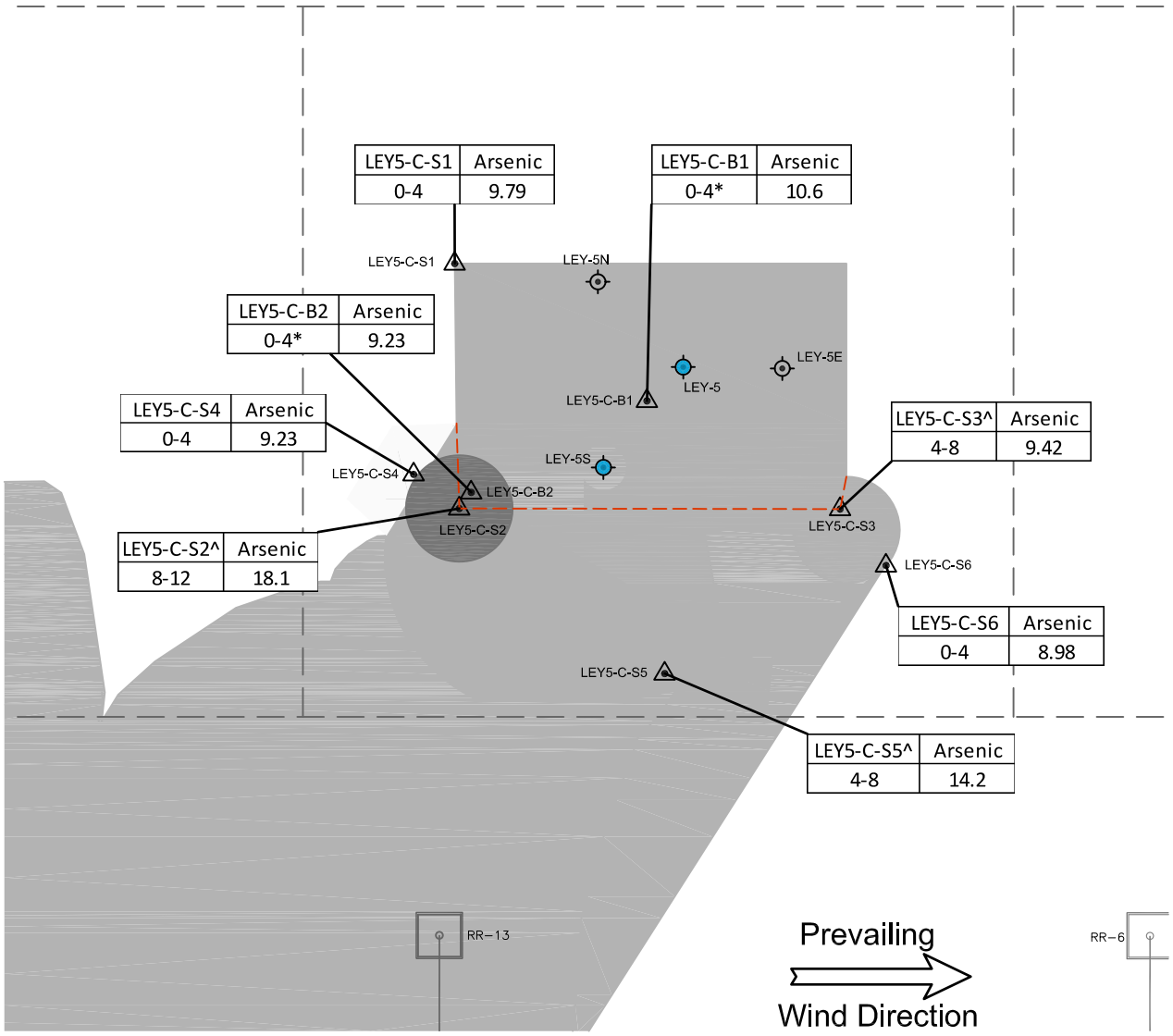

EXPLANATION:

Only arsenic sample results left in place are shown.

Background arsenic concentration is 26 mg/kg.

Sample Name	Analyte
Depth (inches)	Result (mg/kg)

Sample Name:

LEY Leathers equipment yard
C Confirmation sample
-S Sidewall sample, depth measured in inches from initial ground surface.
-B Bottom sample. Locations of (B) bottom samples were selected after lateral extent of excavation was completed.
* Depth of bottom samples measured from base of excavation.
^ Sample initially collected as a sidewall sample, but became a bottom sample after excavation extension.

Confirmation sample collected February - June 2011 during removal activities

Initally proposed area to be addressed

Area removed to 5 inch depth

Area removed to 9 inch depth

PEA sampling point with arsenic less than background concentrations

PEA sampling point with arsenic greater than background concentrations at 0.3"

PEA soil samples collected in June 2007 and March 2008.

Concentrations are in mg/kg (milligrams per kilogram).

N

0 50
SCALE IN FEET

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Leathers Equipment Yard - LEY-5: Removal Area and Confirmation Sample Results
CalEnergy Geothermal Power Plant
Imperial Valley, California

Figure
5d

Drafter: EC | Date: 08/30/11 | Contract Number: 07-485A

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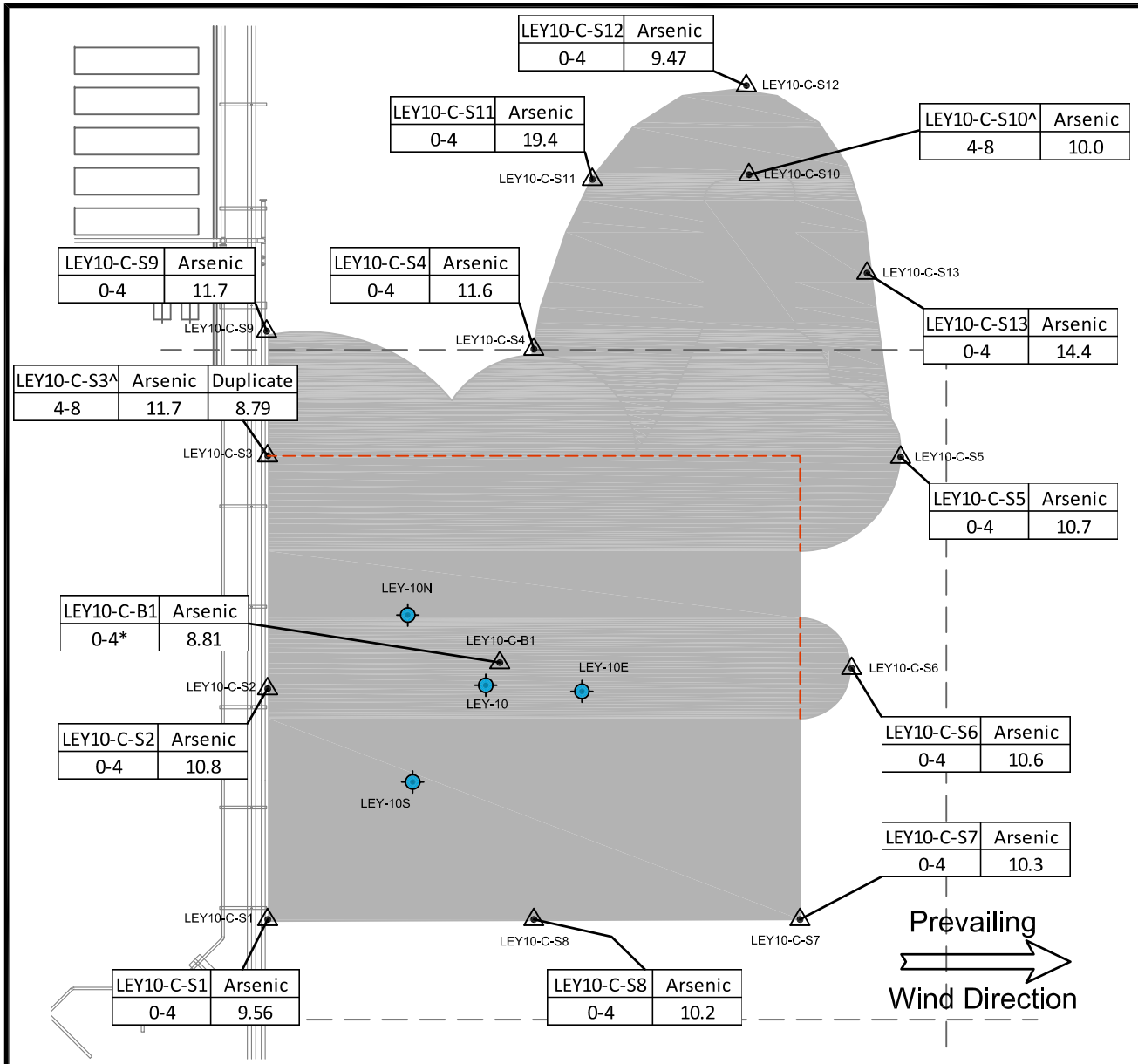

EXPLANATION:

Only arsenic sample results left in place are shown.

Background arsenic concentration is 26 mg/kg.

Sample Name	Analyte
Depth (inches)	Result (mg/kg)

Sample Name:

LEY Leathers equipment yard
C Confirmation sample
-S Sidewall sample, depth measured in inches from initial ground surface.
-B Bottom sample. Locations of (B) bottom samples were selected after lateral extent of excavation was completed.
* Depth of bottom samples measured from base of excavation.
^ Sample initially collected as a sidewall sample, but became a bottom sample after excavation extension.

Confirmation sample collected February - June 2011 during removal activities

Initally proposed area to be addressed

Area removed to 5 inch depth

PEA sampling point with arsenic less than background concentrations

PEA sampling point with arsenic greater than background concentrations at 0.3"

PEA soil samples collected in June 2007 and March 2008.

Concentrations are in mg/kg (milligrams per kilogram).

N

0 50
SCALE IN FEET

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Leathers Equipment Yard - LEY-10: Removal Area and Confirmation Sample Results
CalEnergy Geothermal Power Plant
Imperial Valley, California

Figure
5e

Drafter: EC | Date: 08/30/11 | Contract Number: 07-485A

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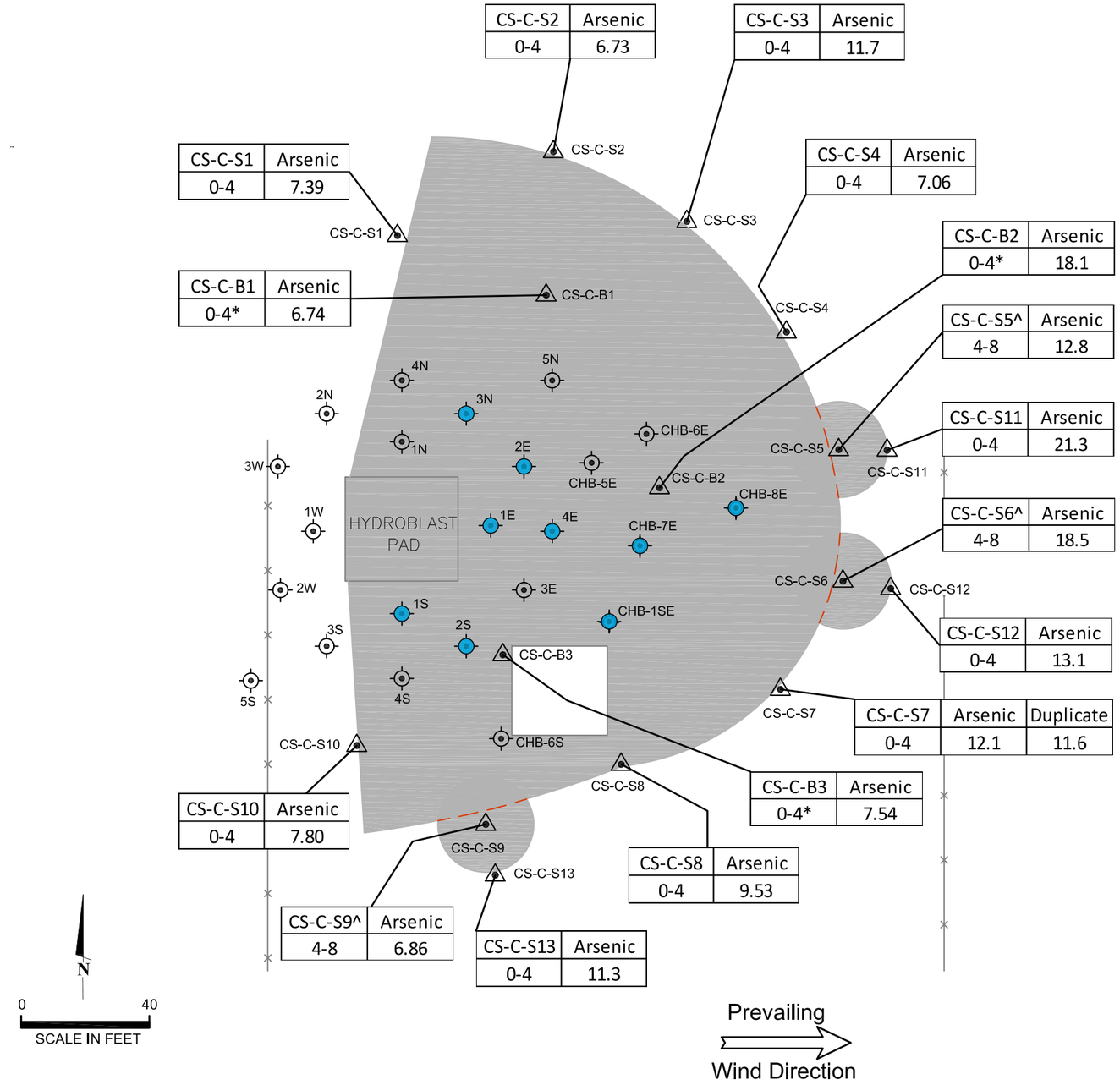
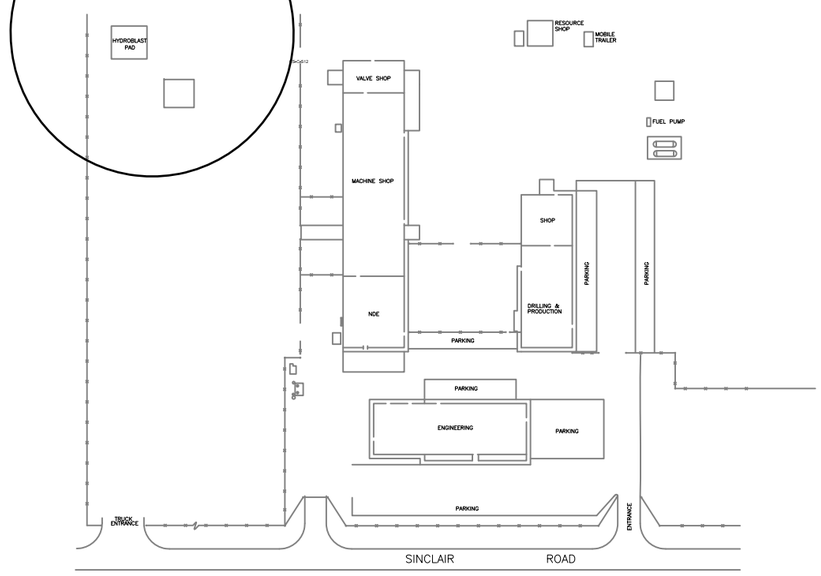


AREA ENLARGED AT LEFT

SITE PLAN



EXPLANATION:

Only arsenic sample results left in place are shown.

Background arsenic concentration is 26 mg/kg.

Sample Name	Analyte
Depth (inches)	Result (mg/kg)

Sample Name:

CS Central services
C Confirmation sample
-S Sidewall sample, depth measured in inches from initial ground surface.
-B Bottom sample. Locations of (B) bottom samples were selected after lateral extent of excavation was completed.
* Depth of bottom samples measured from base of excavation.
^ Sample initially collected as a sidewall sample, but became a bottom sample after excavation extension.

- Confirmation sample collected February - June 2011 during removal activities
- Initally proposed area to be addressed
- Area removed to 5 inch depth
- PEA sampling point with arsenic less than background concentrations
- PEA sampling point with arsenic greater than background concentrations at 0.3"

PEA soil samples collected in June 2007 and March 2008.

Concentrations are in mg/kg (milligrams per kilogram).

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Central Services Hydroblast Pad - Removal Area and Confirmation Sample Results
CalEnergy Geothermal Plants
Imperial Valley, California

Figure **6**

Drafter: EC | Date: 08/30/11 | Contract Number: 07-485A

I:\CAD\07-485-A\Confirmation Soil Removal.dwg

EXPLANATION:

Only arsenic sample results left in place are shown.

Background arsenic concentration is 26 mg/kg.

Sample Name	Analyte
Depth (inches)	Result (mg/kg)

Sample Name:

ELM Elmore
C Confirmation sample
-S Sidewall sample, depth measured in inches from initial ground surface.
-B Bottom sample. Locations of (B) bottom samples were selected after lateral extent of excavation was completed.
* Depth of bottom samples measured from base of excavation.
^ Sample initially collected as a sidewall sample, but became a bottom sample after excavation extension.

Confirmation sample collected February - June 2011 during removal activities

Initally proposed area to be addressed

Area scraped to depth of 5 inches

Impediment to scraping (concrete, asphalt, etc.)

PEA sampling point with arsenic less than background concentrations

PEA sampling point with arsenic greater than background concentrations at 0.3"

PEA soil samples collected in June 2007 and March 2008.

Concentrations are in mg/kg (milligrams per kilogram).

WATER LINE
SOLVENT
ACETYLENE
WAREHOUSE BLDG.
ANTIFREEZE 55gal
DIESEL
FIRE WATER
OIL SUMP
OIL
MAIN XFMR
207
506
685
MCC ROOM
CONTROL BUILDING
G-301
OIL
V-202
V-203
T-406
T-515
V-201
T-504
T-524
STORAGE
FIRE WATER
FILTER CAKE BAY
SUMP
EFC-1
ESI-12NE
ESI-12
ESI-12E
ELM-C-B3
ESI-13
ESI-14
FIRE PUMP
ESI-15
ELM-C-B2
ESI-16
ESI-17
ESI-1
ESI-2
ESI-3
ESI-4
ESI-5
ESI-6
ESI-7
ESI-8
ESI-9
ESI-10
ESI-11
BRINE POND V-900
WATER POND V-800
EZA-1
EZA-2
EZA-3NW
EZA-3N
ELM-C-B1
EZA-3W
EZA-3E
EZA-3
EZA-3SW
ELM-C-S1
PIPING
EZA-3S
Recovery Storage Area

ELM-C-B3	Arsenic
0-4*	7.05

ELM-C-S1	Arsenic
0-4	6.33

ELM-C-B1	Arsenic
0-4*	7.53

ELM-C-B2	Arsenic
0-4*	6.61

Prevailing
Wind Direction

DOWN WIND

PLANT ENTRANCE

SINCLAIR ROAD

N

0 100
SCALE IN FEET

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Elmore Zinc Recovery and Surface Impoundment - Removal Area and Confirmation Sample Resuls
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Imperial Valley, California

Figure
7

Drafter: EC
Date: 08/30/11
Contract Number: 07-485A

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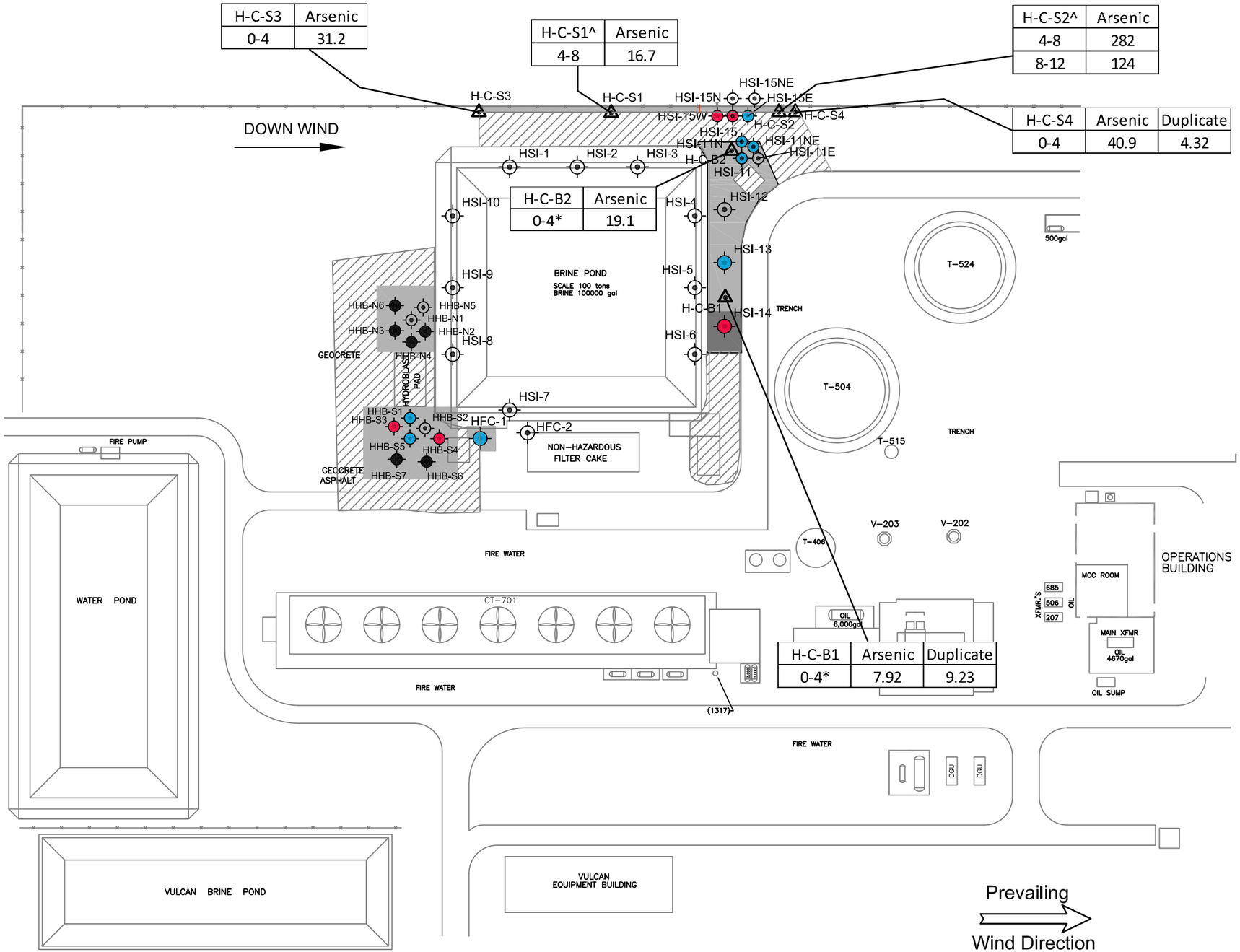

EXPLANATION:

Only arsenic sample results left in place are shown.

Background arsenic concentration is 26 mg/kg.

Sample Name	Analyte
Depth (inches)	Result (mg/kg)

Sample Name:

- H Hoch
- C Confirmation sample
- -S Sidewall sample, depth measured in inches from initial ground surface.
- -B Bottom sample. Locations of (B) bottom samples were selected after lateral extent of excavation was completed.
- * Depth of bottom samples measured from base of excavation.
- ^ Sample initially collected as a sidewall sample, but became a bottom sample after excavation extension.

- Confirmation sample collected February - June 2011 during removal activities
- Initally proposed area to be addressed
- Area removed to 5 inch depth
- Impediment to scraping (concrete, asphalt, etc.)
- Area removed to 13 inch depth
- PEA sampling point with arsenic less than background concentrations
- PEA sampling point with arsenic greater than background concentrations at 0.3"
- PEA sampling point with arsenic greater than background concentrations at 0.3' and 1'

PEA soil samples collected in June 2007 and March 2008.

Concentrations are in mg/kg (milligrams per kilogram).

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Hoch Hydroblast Pad and Surface Impoundment - Removal Area and Confirmation Sample Results
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Imperial Valley, California

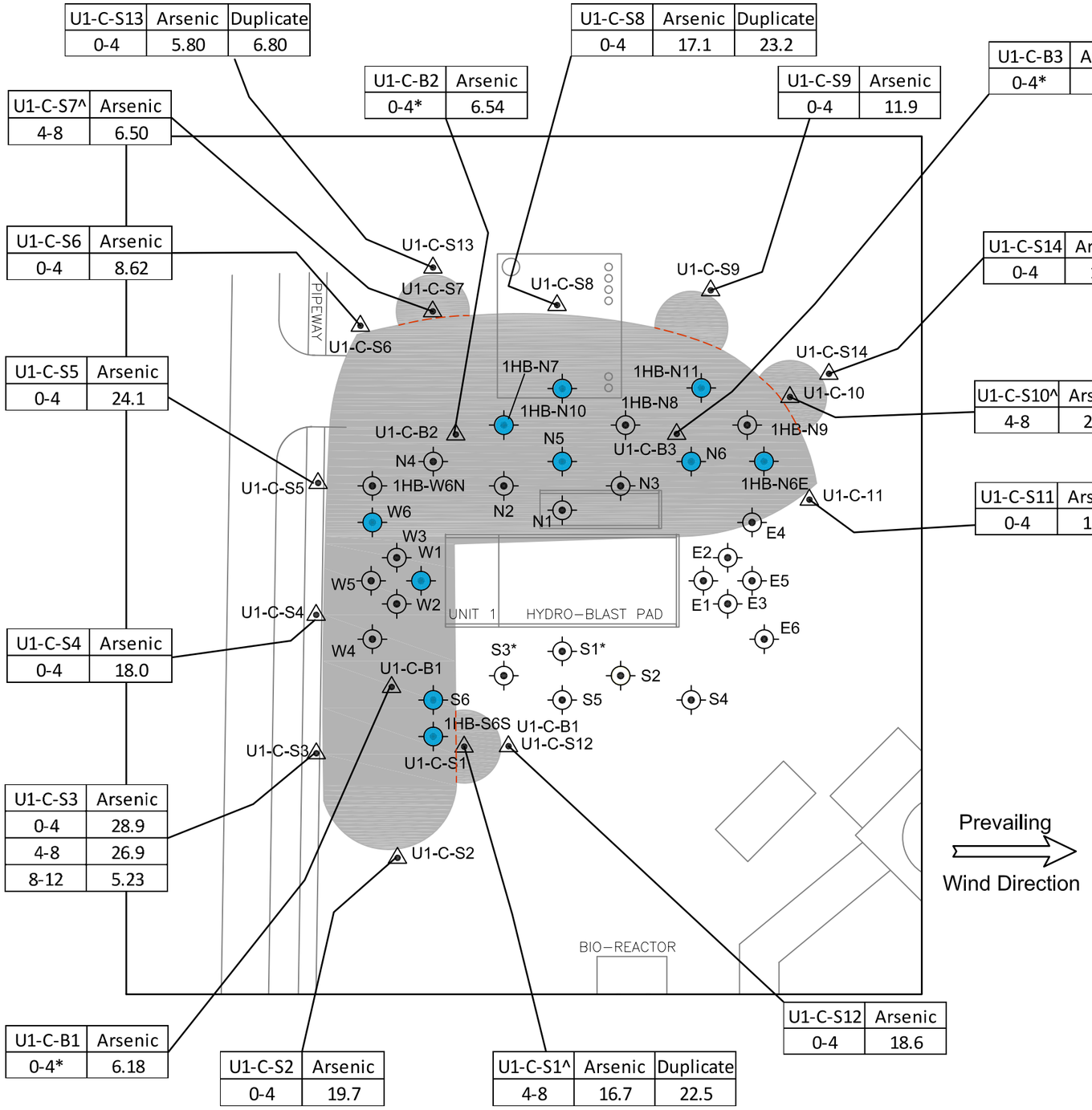
Figure
8

Drafter: EC

Date: 08/30/11

Contract Number: 07-485A

I:\CAD\07\07-485-A\Confirmation Soil Removal.dwg



EXPLANATION:

Only arsenic sample results left in place are shown.

Background arsenic concentration is 26 mg/kg.

Sample Name	Analyte
Depth (inches)	Result (mg/kg)

Sample Name:

U1 Unit 1
C Confirmation sample
-S Sidewall sample, depth measured in inches from initial ground surface.
-B Bottom sample. Locations of (B) bottom samples were selected after lateral extent of excavation was completed.
* Depth of bottom samples measured from base of excavation.
^ Sample initially collected as a sidewall sample, but became a bottom sample after excavation extension.

Confirmation sample collected February - June 2011 during removal activities

Initally proposed area to be addressed

Area scraped to 5 inch depth

PEA sampling point with arsenic less than background concentrations

PEA sampling point with arsenic greater than background concentrations at 0.3"

* Sample locations 1HB-S1 and 1HB-S3 both labeled as 1HB-S1

PEA soil samples collected in June 2007 and March 2008.

Concentrations are in mg/kg (milligrams per kilogram).

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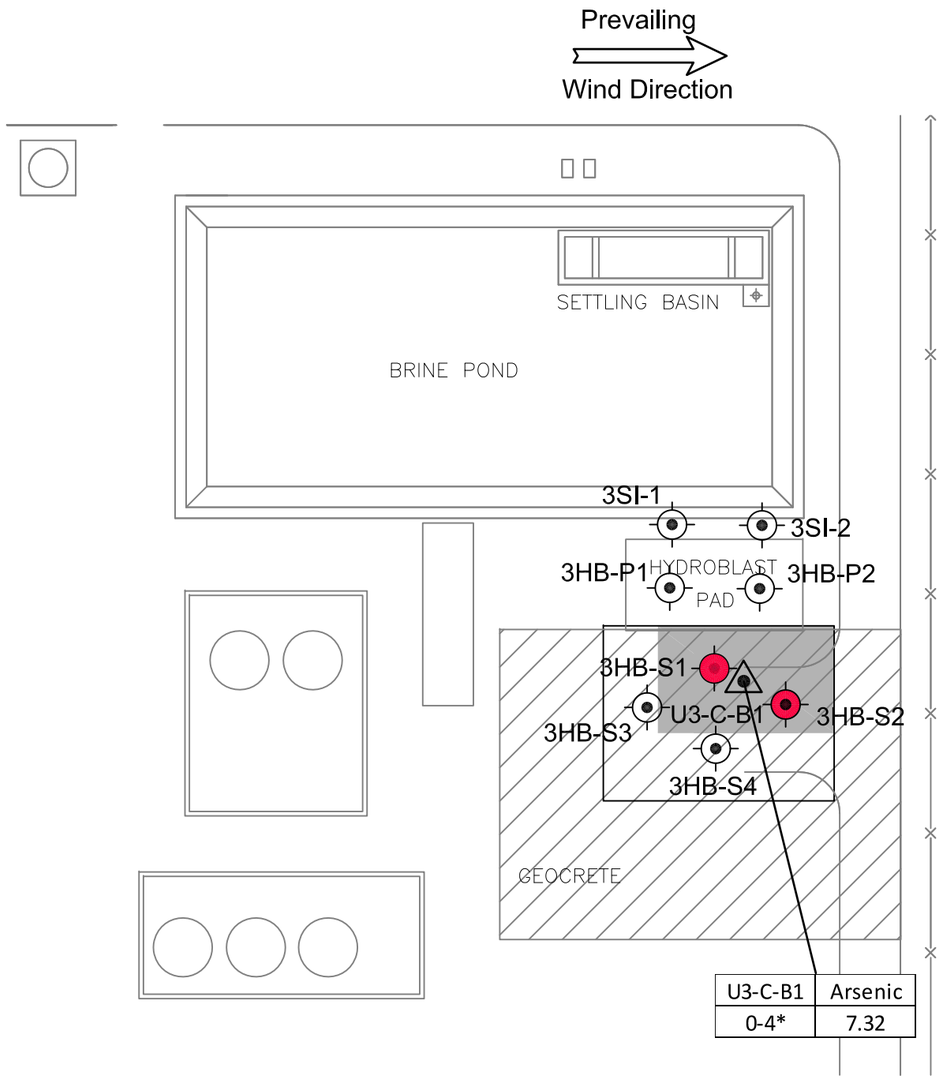
Units 1 and 2 Hydroblast Pad - Removal Area and Confirmation Sample Results
CalEnergy Geothermal Plants
Imperial Valley, California

Figure **9**

Drafter: EC Date: 09/19/11 Contract Number: 07-485A



EXPLANATION:

Only arsenic sample results left in place are shown.

Background arsenic concentration is 26 mg/kg.

Sample Name	Analyte
Depth (inches)	Result (mg/kg)

Sample Name:

U3 Unit 3
C Confirmation sample
-B Bottom sample. Locations of (B) bottom samples were selected after lateral extent of excavation was completed.
* Depth of bottom samples measured from base of excavation.

Confirmation sample collected February - June 2011 during removal activities

Area scraped to depth of 13 inches

Impediment to excavation (concrete, asphalt, etc.)

PEA sampling point with arsenic less than background concentrations

PEA sampling point with arsenic greater than background concentrations at 0.3' and 1'

PEA soil samples collected in June 2007 and March 2008.

Concentrations are in mg/kg (milligrams per kilogram).

N

0 40

SCALE IN FEET

I:\CAD\07\07-485-A\Confirmation Soil Removal.dwg

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Units 3 and 4 Hydroblast Pad - Removal Area and Confirmation Sample Results
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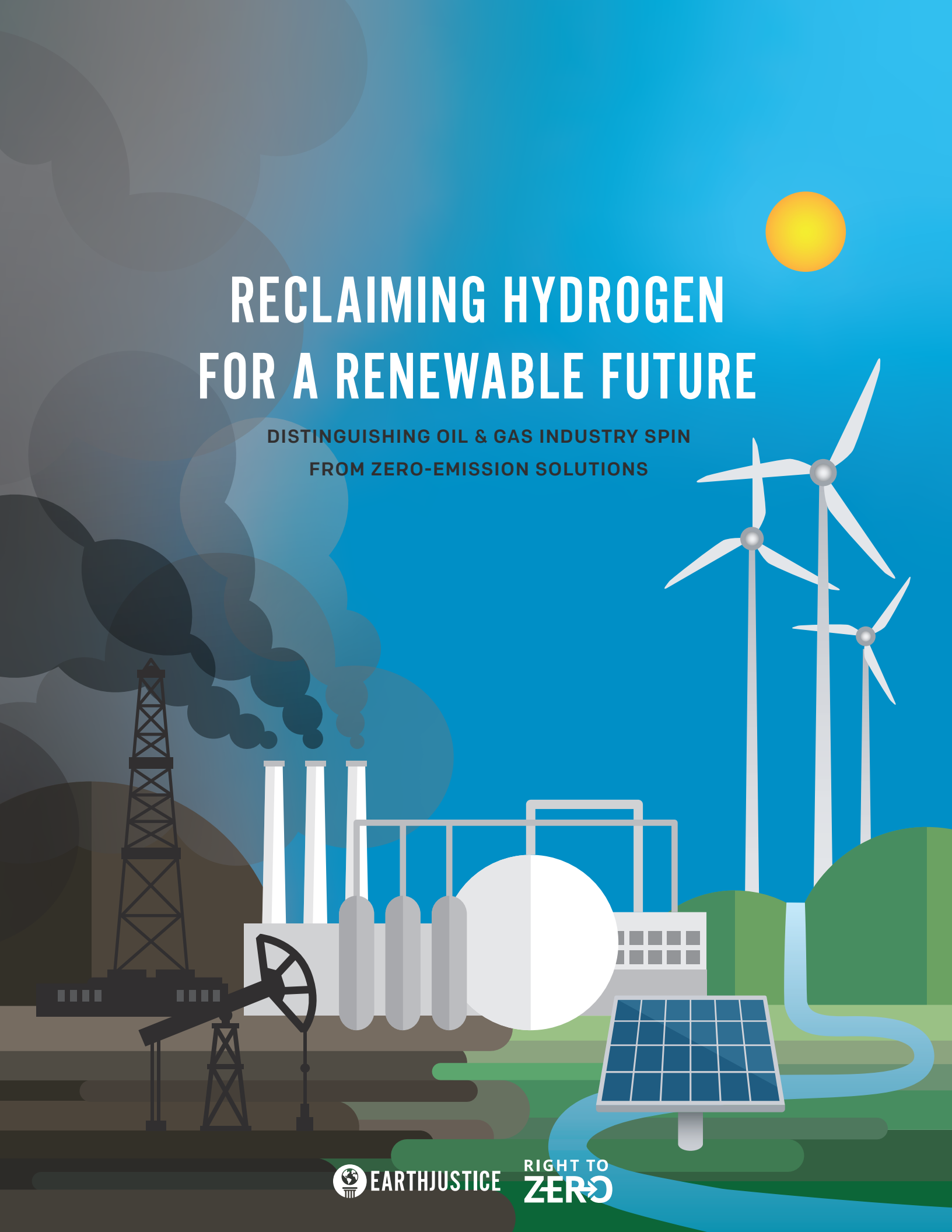
Imperial Valley, California

Figure
10

Drafter: EC | Date: 09/19/11 | Contract Number: 07-485A


RECLAIMING HYDROGEN
FOR A RENEWABLE FUTURE
DISTINGUISHING OIL & GAS INDUSTRY SPIN
FROM ZERO-EMISSION SOLUTIONS
EARTHJUSTICE
RIGHT TO ZERO

AUGUST 2021

Sasan Saadat, **Earthjustice's Right to Zero campaign**

Sara Gersen, **Earthjustice's Right to Zero campaign**

CONTENTS

EXECUTIVE SUMMARY

The fossil fuel industry has helped generate enormous interest around hydrogen, making it difficult for policymakers to tell how much they can rely on hydrogen to meet climate goals. Too often, companies that profit from our reliance on fossil fuels invoke the vague promise of "clean," "renewable," or "green" hydrogen to derail action today. To avoid this trap, policymakers must scrutinize claims about hydrogen and think critically about where it can be a meaningful part of real climate solutions. To reclaim hydrogen for a renewable future, policymakers should explore opportunities to produce hydrogen from renewable electricity and use it to decarbonize sectors that cannot directly rely on a renewable electric grid.

First, reclaiming hydrogen for a zero-emission future requires a transition away from producing it with polluting technologies. Currently, oil and gas companies produce nearly all of the United States' annual supply of hydrogen—about 10 million metric tons—from fossil fuels through a process that pollutes neighboring communities with health-harming emissions and the atmosphere with greenhouse gases. Transforming hydrogen from a climate threat to a climate tool requires a transition to green hydrogen. **Green hydrogen is made using 100% renewable electricity to split hydrogen from water molecules**. For now, this is the only established way to produce hydrogen without emitting greenhouse gases or other health-harming pollutants. This whitepaper helps policymakers distinguish green hydrogen from hydrogen produced through polluting processes using inputs like fossil fuels and gas from factory farms. Fueling an industrial facility with green hydrogen would mitigate climate pollution, but not other pollution from its industrial processes, and so deployment of green hydrogen can never justify a buildout of facilities that would increase toxic pollution.

It will always be more efficient to rely first on the direct use of renewable electricity wherever it is possible to do so, rather than convert that electricity into hydrogen before using it as an energy source.

Once policymakers understand what green hydrogen is, they should consider the barriers to its widespread deployment. It will always be more efficient to rely first on the direct use of renewable electricity wherever it is possible to do so, rather than convert that electricity into hydrogen before using it as an energy source. This principle applies to vehicles, household appliances, and any other sector that has clean electric options for decarbonization. Moreover, relying on green hydrogen will require significant investments in storage and transportation infrastructure like dedicated pipelines because it behaves differently than the methane in our existing fossil gas infrastructure. Leakage in this infrastructure could undermine the benefits of green hydrogen because hydrogen is a greenhouse gas that is five times more potent than carbon dioxide. Scaling up the infrastructure to make green hydrogen widely available will take another decade—too long to delay dramatic reductions of climate pollution in the sectors that have other decarbonization options.

With these limitations in mind, policymakers can identify the sectors for which green hydrogen may nevertheless be a promising decarbonization tool, where it is worth careful exploration, and where they should instead deploy other technologies that are available today.

Our best option for deploying green hydrogen is to displace the fossil fuel-derived hydrogen already in use today. However, hydrogen is not an excuse to build or expand polluting industrial facilities. After additional study, policymakers may also find that green hydrogen is an appropriate tool for decarbonizing maritime shipping, aviation, industrial processes that require high temperatures, long-distance trucks or trains, and/or a small portion of our electricity supply. Given the limits on the supply of green hydrogen that are likely to persist for another decade, in the near-term, policymakers should reserve it for sectors that do not have other viable decarbonization options.

The gas industry has used false promises around hydrogen to hinder commonsense climate action, such as the shift to electric appliances like the induction stove top pictured here. *Tom Werner / Getty Images*

For the sectors that have zero-emission solutions available today, policymakers should embrace those solutions and reject any suggestion that climate action can wait for green hydrogen. For instance, the gas industry has used false promises around hydrogen to fight commonsense proposals to transition to clean, electric alternatives to burning gas in residential and commercial appliances. However, green hydrogen cannot make a meaningful dent in the climate pollution from these gas-fired appliances and the leaky pipelines that deliver gas to America's homes and businesses.

Meeting the scale and urgency of the climate crisis will require deployment of renewable resources on an unprecedented scale and a widespread transition to electric models for things like household appliances and cars—uses where electric technologies are readily available and economies of scale will further drive down costs. For instance, in the

transportation sector, battery-electric vehicles are the most promising decarbonization strategy for most on-road vehicles. Stabilizing the climate will require aggressive near-term investments in these vehicles and their fueling infrastructure, regardless of whether green hydrogen may prove to be a cost-effective tool for some heavy-duty long-haul vehicles.

Green hydrogen provides an additional reason to deploy renewable energy resources at an unprecedented pace. Not only are massive investments in renewable resources like wind and solar necessary to decarbonize the electric grid, but economies of scale in renewable electricity generation are key to driving down the cost of green hydrogen. Despite industry rhetoric to the contrary, green hydrogen is not an excuse to build, expand or continue operations at gas-fired power plants. Even if future innovations may make it possible to retrofit these combustion turbines to operate solely on green hydrogen, the facilities would continue to pollute the air and burden the water supply. Today's renewable energy and battery technologies can cost-effectively supply 80% of the electricity we need by 2030 and 90% by 2035. Green hydrogen is a potential tool for achieving a fully decarbonized electric grid because it can store renewable energy for long periods and convert it back into electricity with zero-emission fuel cell technologies.

As we continue to electrify everything that can feasibly plug into a clean power grid, we can strategically deploy green hydrogen to displace the fossil-derived hydrogen that industry is using today and to power sectors that are otherwise difficult to electrify. When used as a marketing tool by the fossil fuel industry, hydrogen can be used to hinder necessary climate action. But when reclaimed and deployed as a solution to decarbonize sectors we cannot otherwise electrify, green hydrogen can play an important role in a zero-emission future.

INTRODUCTION

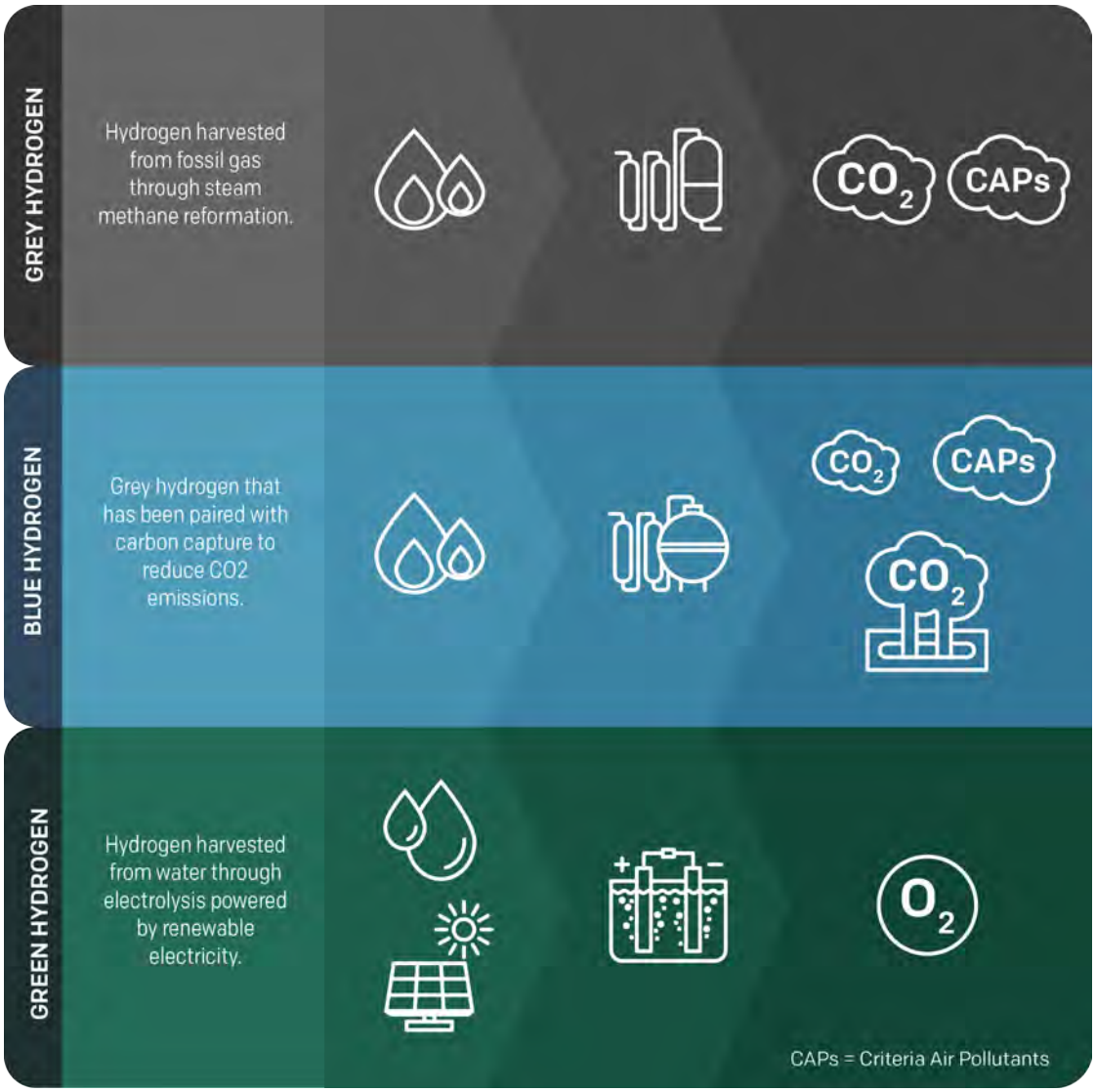
To chart a course toward a safer climate and more habitable planet, we must rapidly reduce emissions of greenhouse gases across our society. The biggest contributor to greenhouse gas emissions is the burning of fossil fuels. Consequently, the clearest path to reducing emissions is to switch from fossil fuels to renewable, zero-emission energy in our transportation, buildings, and power generation (sectors that are collectively responsible for about 75% of United States' greenhouse gas emissions).[1] This transition would make significant strides in eliminating the devastating public health impacts of pollution throughout the life cycle of fossil fuels—pollution that is most severely concentrated in Black, Brown, Indigenous, and poor communities.[2] A just transition will also require careful policy design and meaningful engagement from frontline communities. Renewable energy, energy efficiency, and electrification are zero-emission solutions that eliminate both greenhouse gases and health-harming air pollution. To meet the scale and urgency of the climate crisis will require deployment of renewable resources on an unprecedented scale—ultimately achieving 100% clean power generation—and a complete transition to efficient, electric models for things like household appliances and cars.

As we electrify everything that can feasibly plug into a clean power grid, "green hydrogen" is a promising tool for transitioning to renewable energy in sectors that lack a viable route to direct electrification. Green hydrogen is hydrogen produced by using 100% renewable electricity to split water molecules.

To understand the potential role of green hydrogen, consider the challenges of cutting climate pollution from one hard-to-electrify sector: maritime shipping. Maritime travel is difficult to decarbonize because battery-powered ocean-going vessels will not be able to handle long-haul voyages across the ocean, at least for the foreseeable future. The hope for green hydrogen is that it may store energy from clean electric resources like wind and solar in a fuel that could be used to propel large, long-haul ships. This vision is at least a decade away from reality, if it overcomes the challenges to cost-effective production and efficient on-vessel storage. Still, it offers a path to displacing the highly polluting bunker fuel currently relied on to move much of the world's goods across oceans.

Section I describes the status quo in industrial hydrogen production. Despite hydrogen's potential to become a climate solution in the future, today's reality is that global hydrogen production—more than 99.8 % of which is not green—is responsible for an enormous amount of climate pollution, more than the entire nation of Germany.[3] Oil and gas companies produce almost all of the United States' hydrogen supply from fossil gas, through a pollution-intensive process called steam methane reformation. Communities near oil refineries bear the brunt of this pollution because hydrogen production most often takes place at refineries, which are the main hydrogen consumers.

Figure 1. Three Types of Hydrogen Production



Globally, less than 1 percent of hydrogen is produced through electrolysis and less than 0.02% is green hydrogen (i.e., produced from electrolysis powered purely by renewable electricity).[4] **Using hydrogen will not break our dependence on fossil fuels unless we quit relying on fossil fuels to produce hydrogen**.

Section II discusses the fossil fuel industry's recent public relations blitz supporting increased reliance on hydrogen. The fossil fuel industry has created a wave of hype around investments in hydrogen, which often conflates green hydrogen with the polluting hydrogen that the industry produces from fossil gas. One of the industry's main strategies is to fund trade associations that advocate for policies that would increase hydrogen production from renewables and fossil fuels alike. Companies are also using hydrogen to greenwash new investments in fossil fuels, as they attempt to justify infrastructure projects with the vague and unsupported notion that the fossil fuel infrastructure might one day be repurposed for hydrogen. Policymakers must carefully scrutinize claims about hydrogen becoming a climate solution because the fossil fuel industry is aggressively promoting investments in hydrogen that would benefit their shareholders, but are not wise climate solutions.

Section III discusses the definition of green hydrogen and the challenges to its widespread deployment. To help policymakers avoid unsustainable or costly decisions, this report offers criteria to help decide where it might be appropriate to deploy green hydrogen. Widely deployed green hydrogen is still at least a decade away and will always be less efficient than directly using renewable electricity wherever feasible. Still, green hydrogen could be a good climate solution for specific applications in a sector if:

CRITERIA FOR DEPLOYING GREEN HYDROGEN

1. There are no low-cost decarbonization strategies available;
2. There are no electric technologies being developed that could take advantage of zero-emission electricity directly;
3. The logistics and costs of infrastructure for hydrogen transportation and storage can be contained;
4. Technologies for using hydrogen fuel in the sector are or will be available; and
5. Transitioning to green hydrogen could reduce air pollution.

Section IV discusses the potential for green hydrogen as a decarbonization tool in different sectors. Based on the considerations presented in Section III, the highest priority and best use for green hydrogen is to displace the massive amounts of fossil-derived hydrogen that are currently being used in industrial processes. For the next few years, volumes of green hydrogen will be small and costs will be high. Policymakers need to direct this precious resource to displace existing, pollution-intensive hydrogen, rather than create new pots of hydrogen demand.

STEAM METHANE REFORMATION

Methane is made up of 1 carbon and 4 hydrogen atoms. To obtain hydrogen, high-temperature steam (water vapor at 700-1000 °C) reacts with the methane under pressure. The reaction of methane (CH_4) and water vapor (H_2O) produces hydrogen gas (H_2) and carbon monoxide (CO). A second reaction (pressure swing adsorbtion) is performed with additional steam (H_2O) to purify the CO and CH_4 mixture, leaving more Hydrogen and carbon dioxide (CO_2).

$CH_4 + H_2O$ (steam) $\rightarrow CO + 3H_2$
$CO + H_2O$ (steam) $\rightarrow CO_2 + H_2$

In the 2030s, green hydrogen's role could expand to address hard-to-electrify sectors or provide a small portion of our electric power supply by storing surplus renewable energy. Maritime shipping, aviation, high-heat industrial processes, and long-haul trucking are all potential applications for green hydrogen that policymakers should explore with caution. **In the meantime, the declining cost of renewables and batteries is widening the range of things that can easily be electrified, potentially narrowing the applications for which hydrogen should be considered.**

There are some sectors for which hydrogen is a dead end. The chief subject of misleading industry hype is the gas distribution network. The pipeline system that delivers methane to gas-fired appliances in homes and businesses cannot carry a significant amount of hydrogen—researchers estimate that hydrogen can only comprise about 7% of its energy content before hydrogen creates safety hazards. Nonetheless, gas companies tout hydrogen as a means of continuing their business model, while fighting against a climate solution that is available today: a full transition to electric appliances.

The very real risk is that these fossil fuel industry initiatives use the idea of green hydrogen to drive climate investments toward fossil fuel assets while siphoning them away from established, zero-emission solutions. The most urgent, near-term priority for climate action is accelerating deployment of the solutions that are already available and managing the transition from the fossil fuel economy. In addition to these aggressive near-term actions, policymakers can explore the potential for green hydrogen to decarbonize hard-to-electrify sectors.

These gas distribution lines cannot be used to deliver pure hydrogen. Injecting appreciable volumes of hydrogen in gas lines to burn in gas appliances poses health and safety risks. *Kevin Lucas, EyeEm / Getty Images*

I TODAY, HYDROGEN PRODUCTION RELIES ON FOSSIL FUELS AND THREATENS OUR CLIMATE AND PUBLIC HEALTH

The recent hype around hydrogen can mask the fact that the fossil fuel industry already produces hydrogen on a massive scale, with devastating consequences for the climate and communities. Gas companies and oil refineries are responsible for producing nearly all of the United States' annual supply of hydrogen—about 10 million metric tons[5]—through an energy-intensive industrial process called steam methane reformation (SMR) of fossil gas.[6,7] Coal gasification is also a significant source of hydrogen production in other parts of the world, accounting for 2% of global coal demand.[8] Globally, hydrogen production's toll on the climate is so great that hydrogen production is responsible for more greenhouse gas emissions than the entire country of Germany.[9]

In addition to emitting greenhouse gases, SMR emits pollution that harms public health in neighboring communities, including nitrogen oxides, fine particulate matter, carbon monoxide, and volatile organic compounds.[10] While SMR plants contribute to warming the climate globally, their local impacts are concentrated in the same communities on the frontlines of oil refineries. Oil refining company Phillips 66 for example, recently entered an agreement with industrial gas company Linde, to **build what will be the largest hydrogen production unit in the United States**.[11] The SMR project is being constructed in St. James Parish, Louisiana[12]—a predominately African-American community in the heart of a region of the U.S. Gulf Coast known as "Cancer Alley," so-named because the concentration of petrochemical plants and refineries cause high rates of cancer in local residents.[13]

The fossil fuel industry is not just the primary producer of hydrogen—it is also the primary consumer of hydrogen. Roughly 60% of domestic hydrogen demand comes from crude oil refineries,[14] where it is used to lower the sulfur content of diesel.[15] Demand for hydrogen from refineries continues to rise alongside

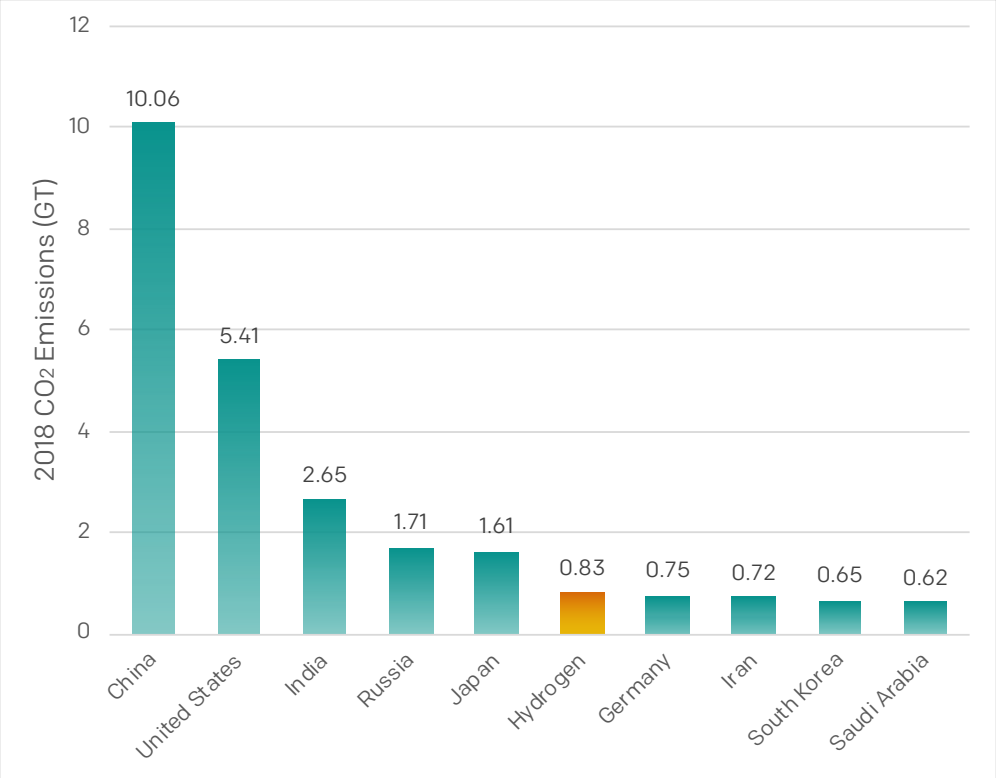


Figure 2. Top 10 Carbon Dioxide Emitters - 2018[21]

increasing global demand for diesel fuel. Global hydrogen demand has grown 28% over the last decade,[16] which means that pollution from producing hydrogen from fossil fuels is also increasing.[17] After the petroleum industry, the second largest consumer of hydrogen (about 30%) is industrial agribusiness, which uses hydrogen as a feedstock for chemical fertilizers.[18] The remainder (~10%) is used for other chemical and industrial processes like methanol production.[19]

The fossil fuel industry has multiple incentives for promoting hydrogen. First, the industry's vision for hydrogen calls for continued reliance on fossil gas to produce hydrogen, expanding existing revenue streams.[20] In contrast, a transition to a zero-emission economy means rejecting hydrogen from fossil fuels and *only* using green hydrogen, which is derived from 100% renewable electricity. Second, industry sometimes uses rhetoric about green hydrogen to justify new infrastructure for fossil gas. Gas utility companies boost their profits when they build more pipelines to deliver fossil gas to homes and businesses, with the monopolies' captive customers footing the bill. Some gas companies are fighting to expand their fossil gas infrastructure by spreading misleading claims about the potential for hydrogen to decarbonize their gas. Similarly, companies that profit from building gas-fired power plants are beginning to rely on the promise that they might one day retrofit these facilities to burn green hydrogen to justify investments in new gas-fired electricity generators.

The bulk of hydrogen demand in the United States today is for use in crude oil refineries. The fossil fuel industry is the country's primary producer and consumer of hydrogen. *Thomas Northcut / Getty Images*

II THE FOSSIL FUEL INDUSTRY IS CAMPAIGNING TO INCREASE RELIANCE ON HYDROGEN FROM FOSSIL FUELS

Policymakers must carefully scrutinize claims about hydrogen's role in reducing climate pollution because much of the hype around hydrogen comes from the fossil fuel industry, whose foremost interest in protecting shareholder profits may not align with sensible climate strategies. As public demand for climate action continues to rise, hydrogen has taken on a central role in the oil and gas sector's long-term planning.[22] In March 2021, several oil majors, gas companies, and fossil fuel-intensive utilities launched the "Clean Hydrogen Future Coalition," which urged the Biden administration to increase policy support for a wide range of hydrogen production methods and uses.[23] Oil and gas companies have joined with other industries —primarily chemical and car companies—to form at least six trade associations to advocate for more hydrogen production in the United States.[24] As a recent article in *Nature Climate Change* observed, "the gas industry is turning to hydrogen for a new lease of life."[25]

U.S. fossil fuel companies are following a playbook that oil and gas companies have already played in Europe and Australia.[26] In the United Kingdom, a group called "the Hydrogen Taskforce," backed by BP, Shell, and a slew of gas companies, launched to advance the mission of securing hydrogen's role in the energy transition through increasing government investment. The Taskforce's focus is on increasing support for hydrogen injection into the gas grid, with goals such as achieving 100% hydrogen for home heating[27] (a goal the UK's climate chief properly called "unwieldy and impractical").[28] In the European Union, a report by watchdogs revealed that the hydrogen lobby there—mainly comprised of the gas industry—spent nearly 60 million euros successfully convincing the European Commission to pursue a "Hydrogen Backbone." This vision calls for blending small amounts of hydrogen in the existing gas system with the aspiration of eventually expanding and repurposing that system.[29] The report also highlights how a major global lobbying group, the Hydrogen Council, was launched in 2017 by FTI Consulting, a public relations firm exposed for setting up fake "grassroots groups" in the United States to oppose climate action.[30] The Australia Hydrogen Council, which similarly draws most of its members from the gas industry, as well as the oil and auto industries, is focused on advancing a vision of hydrogen-powered transportation, and calls for "incentives or government policies created to drive scalability [to] initially be hydrogen technology agnostic."[31] In California, a coalition of oil, gas, hydrogen, and auto companies wrote to Governor Gavin Newsom asking him to invest half of the $1 billion dedicated to zero-emission transportation toward "hydrogen fuel infrastructure to serve the light-duty, transit and heavy-duty vehicle markets."[32] Similarly, the Clean Hydrogen Future Coalition, which includes large gas trade associations and companies, as well as oil majors BP and Chevron, sent a recent letter to President Biden calling for additional funding and tax incentives for "clean" hydrogen "from a variety of energy resources" for the power and transportation sectors.[33]

There are common themes that emerge across these efforts: the largest backers of hydrogen efforts are oil and gas companies; their marketing materials lead with the benefits of green hydrogen, but explicitly advocate for "all-of-the-above" hydrogen production, which is currently dominated by fossil fuel-derived hydrogen; and they primarily focus on the benefits of using hydrogen for injection in the gas grid or as a vehicle transportation fuel (where the transition to direct electrification is already underway).

III HYDROGEN CAN BECOME A DECARBONIZATION TOOL IN THE FUTURE IF POLICYMAKERS SEPARATE THE PROMISING OPPORTUNITIES FROM FOSSIL FUEL INDUSTRY HYPE

This section provides information to help policymakers understand the potential for using green hydrogen to reduce emissions and to identify instances where industries are making misleading claims about hydrogen to fight climate solutions that are available and cost-effective today. First, we explain what it means for hydrogen to be "green," which is a critical concept to understand in light of the many industry claims of "clean," "renewable," and "green" hydrogen that include highly polluting production pathways. Next, we explain the challenges to deploying green hydrogen. Policymakers should consider these limitations to determine where green hydrogen could be a useful decarbonization strategy.

1. FOR NOW, THE ONLY ESTABLISHED WAY TO MAKE HYDROGEN WITHOUT GREENHOUSE GAS EMISSIONS IS BY USING RENEWABLE ENERGY TO FUEL ELECTROLYSIS.

The first step in understanding whether a hydrogen project is a practical climate solution is to ask how the hydrogen is made. As discussed above, the predominant method for producing hydrogen today is a highly polluting process called steam methane reformation of fossil gas. Creating hydrogen that is suitable for a sustainable and equitable energy transition requires a total transformation in how it is produced. Today, the only established method of producing hydrogen without emitting greenhouse gases or other pollution is using renewable electricity to power electrolysis: a process that splits hydrogen from water molecules. We use the more specific term "green hydrogen" in this report to refer to this kind of hydrogen, consistent with the International Energy Agency's definition of "green hydrogen": hydrogen produced "using electricity generated from renewable energy sources."[34] While other nascent production pathways are being explored for producing hydrogen without pollution,[35] it would be premature to include other technologies in a definition of green hydrogen before they prove their ability to produce hydrogen without emissions.

To rely on electrolytic hydrogen as a climate strategy, it is essential to use 100% renewable energy to produce the hydrogen. Because electrolysis is so energy-intensive, hydrogen made with grid-average electricity is *even more carbon intensive than hydrogen made from SMR of fossil gas*. This is true even in California, which has a cleaner electric grid than most of the country.[36]

To deliver meaningful environmental benefits, green hydrogen production must be paired with the build-out of new renewable resources and/or use surplus renewable energy. If hydrogen producers were to buy power from existing hydropower, solar, or wind facilities, the customers who have historically purchased that renewable energy are liable to shift to grid-average electricity or contract with a fossil fueled generator. When power plants burn more fossil fuels to serve these customers, it defeats the purported environmental benefits of the "green" hydrogen producers using renewable energy. This phenomenon is known as "resource shuffling."

To deliver meaningful environmental benefits, green hydrogen production must be paired with the build-out of new renewable resources and/or use surplus renewable energy.

Policymakers should exercise caution with other forms of hydrogen that industry touts as "clean," "renewable," or even "green." For instance, the California Air Resources Board allows California hydrogen producers to call hydrogen derived from fossil fuels "renewable" when the companies match their fossil gas with the "environmental attributes" of biomethane from landfills in Mississippi and dairies in Indiana.[37] These companies market their hydrogen as "renewable" even though it is made from fossil gas, using the polluting steam methane process we describe above. Policies will not

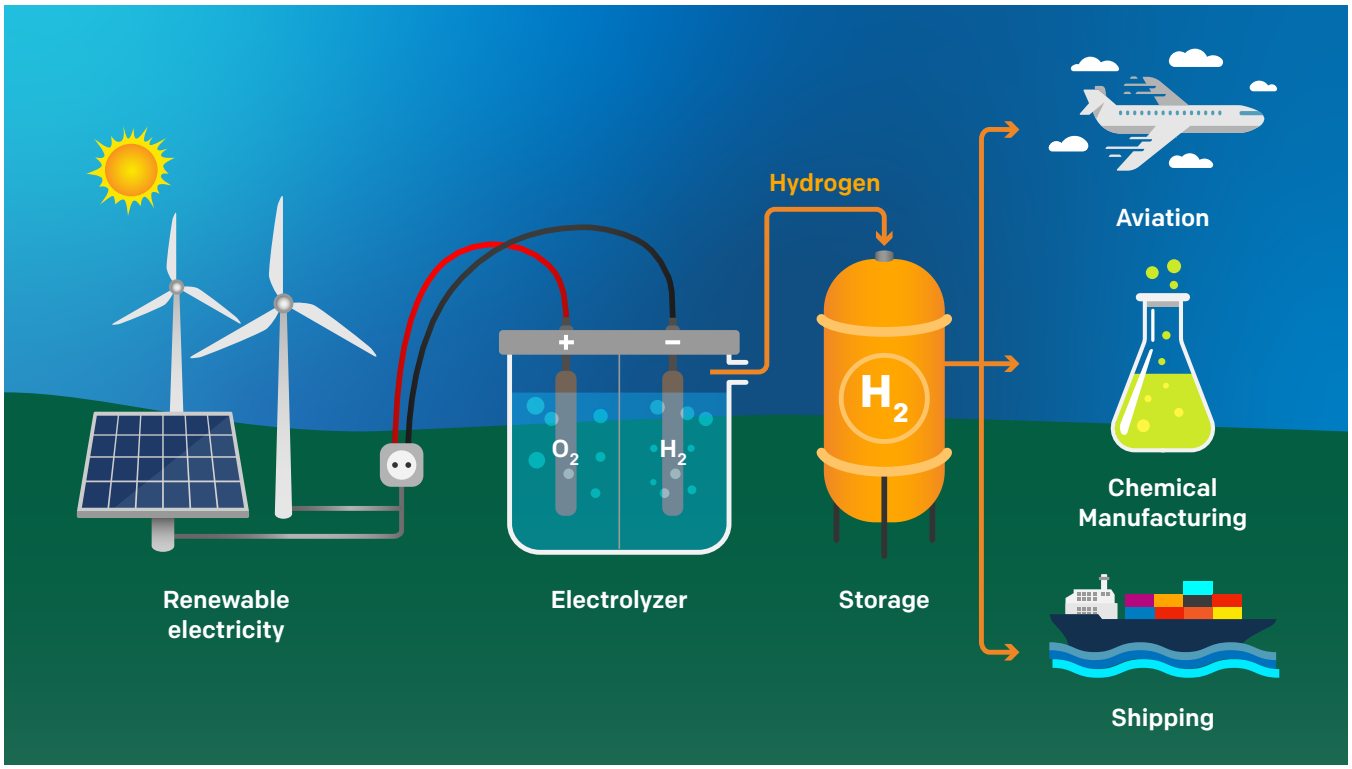


Figure 3. Green hydrogen production and use

catalyze the deployment of innovative technologies if their definition of "clean," "renewable," or "green" hydrogen includes the industry's business-as-usual practices paired with biomethane credits.[38]

The hydrogen industry's preferred definition of "green" hydrogen includes any hydrogen made from biomethane or biomass,[39] regardless of its climate and public health harms. For instance, this definition of "green hydrogen" would include hydrogen made from crops grown for the specific purpose of becoming an energy source. Although biomass conversion is sometimes touted as an opportunity to harness materials that would otherwise go to waste, the economic reality is that the cost-effective and logistically manageable sources of biomass are not dispersed waste streams, but energy crops. Data on the climate impacts of the U.S. EPA's Renewable Fuel Standard shows why it is essential to exclude purpose-grown energy crops as a feedstock for hydrogen. The Renewable Fuel Standard provides an incentive to increase biofuel production even though the EPA's review showed the program had led to

EUROPEANS LEADING THE WAY ON DEPLOYING THE TECHNOLOGY TO PRODUCE GREEN HYDROGEN

In 2020, the European Commission set a target to deploy 6 GW of renewable hydrogen electrolyzers by 2024 and 40 GW by 2030.* Meeting this goal will require a massive scale up of manufacturing capacity, which the European Commission predicts could cut the costs of electrolyzers in half by 2030. Wider deployment of electrolyzers can reduce the cost of production by both allowing manufacturers to achieve economies of scale and by spurring competition between suppliers. The United States should also develop a strategy for scaling up its electrolyzer manufacturing capacity or risk being left behind.

*Neil Ford, *Europe must double green hydrogen projects to hit target* (Aug. 26, 2020), https://www.reutersevents.com/renewables/wind/europe-must-double-green-hydrogen-projects-hit-target.

the conversion of up to 8 million acres of land—nullifying and overwhelming any climate benefit the program might have had.[40]

Timber is another example of a biomass feedstock that could contribute significant greenhouse gas emissions. Policymakers must not assume that biomass from forests is a carbon-neutral source of energy, especially when there is no guarantee that logged forests will have a chance to regrow. Even when trees can regrow, it will take many decades or more than a century to recapture the carbon that enters the atmosphere when forests are logged for energy.[41]

In addition to the unproven climate benefits of biomethane- and biomass-based hydrogen, the public health and environmental harms of many biogenic feedstocks make it misleading to call this hydrogen "green." As the Federal Trade Commission has explained, consumers can interpret claims that a product has a general environmental benefit to mean that the product has no negative environmental impact.[42] Consumers' expectations for the environmental integrity of a "green" product are directly at odds with the production methods for many biogenic feedstocks, such as biomethane from cow manure lagoons. Policies that create a market for biomethane inadvertently increase pollution from industrial agriculture facilities, whose air and water pollution cause significant harm to neighboring communities that are disproportionately low-income and communities of color.[43]

Producing hydrogen from fossil fuels with carbon capture to reduce emissions (what is often referred to as "blue hydrogen") is also not compatible with a zero-emission future. Even after an industrial facility installs expensive carbon capture technologies, it will continue polluting because that equipment is expected to capture 85% to 95% of a facility's climate pollution at best.[44] The process of capturing, compressing, transporting, and storing carbon is energy intensive.[45] With a power plant, for example, carbon capture can consume 30-50% of the plant's energy output.[46] Even if it were powered by renewable energy, the environmental benefit of this added energy and cost can be undermined by leakage of stored carbon.[47] Capturing carbon also does not reduce emissions of most health-harming air pollutants, such as particulate matter and nitrogen oxide, and some researchers estimate that it will lead to lifecycle *increases* of these pollutants in line with the additional fuel needed as a result of efficiency losses and increased energy use.[48]

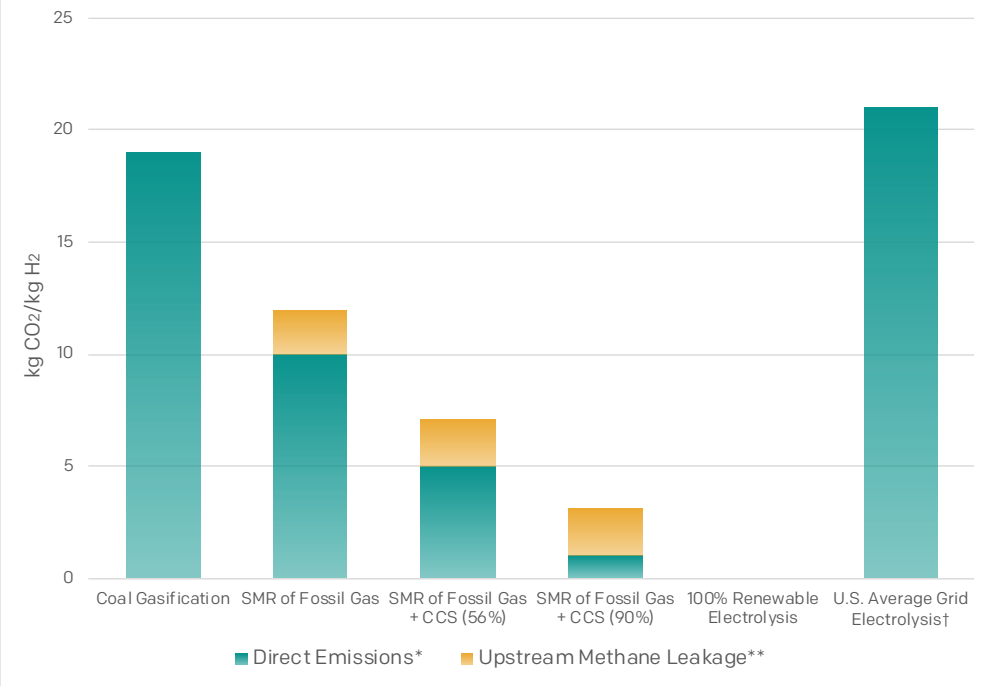


Figure 4: Carbon Intensities of Hydrogen Production

*Source: Bartlett and Krupnick 2020; IEA 2019

**Source: NRDC 2021

† 2017 Data, does not include upstream emissions

Moreover, carbon capture does not address the significant upstream emissions from extracting and then transporting gas across a leaky pipeline network. In the past few years, a growing number of studies have revised upward the scale of unaccounted-for leaks of methane from gas production, processing, transmission, and storage.[49] **Based on an analysis by the Natural Resources Defense Council, accounting for current upstream leakage at average rates reported in the United States would add another 2.1 kg CO_2/ kgH_2 to the carbon intensity of blue hydrogen—roughly double the onsite emissions for SMR with 90% carbon capture.**[50] Even the vice president of Norwegian oil company Equinor (which is aiming to be a global leader in blue hydrogen production) acknowledged that 100% carbon capture from methane reforming is not physically possible, and admits that upstream emissions risk "killing the concept of blue hydrogen."[51]

Carbon capture does not address the significant upstream emissions from extracting and transporting fossil gas.

A recent United Nations report warns that the world must immediately slash methane emissions to stall near-term warming and avoid crossing irreversibly damaging climatic tipping points while we pursue rapid decarbonization. Extending and expanding reliance on methane-leaking infrastructure ignores this message.[52] Capturing carbon from fossil-fueled hydrogen production leaves these significant emissions unabated, yet comes at substantial added cost—so far, the cost of captured carbon has only been economically feasible when the carbon is used for enhanced oil recovery, which instigates further fossil fuel production and the related emissions.[53] Consequently, industry analysts and environmental groups alike warn that this strategy is likely an unwise and distracting investment.[54]

2. LIMITATIONS OF GREEN HYDROGEN

Green hydrogen cannot deliver near-term emissions reductions at scale because of several constraints: the significant amount of renewable energy that is lost through conversion into green hydrogen, high costs, difficulty of storage and transport, and environmental challenges such as water demand from its production. In sectors where industry might retrofit equipment that burns fossil gas to burn hydrogen, there is the additional risk that a transition to green hydrogen could increase air pollution. These constraints limit both the supply of green hydrogen and our ability to use it. Moreover, because dramatic reductions in greenhouse gas emissions must begin this decade to avert climate catastrophe, we must immediately decarbonize sectors that have solutions available today and cannot wait for the widespread availability of green hydrogen.

Therefore, proposals to use green hydrogen must be vetted on a case-by-case basis to assess whether and how they manage these constraints, and whether doing so is more cost-effective than directly using renewable electricity. Because of its scarcity, competition for green hydrogen among sectors could drive up the cost. Conversely, limiting green hydrogen demand to only essential sectors under scenarios with high renewable penetration could allow its use at negligible extra cost.[55] In the short term, the only plausible economical option will be using renewable-driven electrolysis systems for niche applications in hard-to-abate sectors where infrastructure buildouts can be contained.[56]

Energy inefficiency

Using renewable electricity to power electrolysis results in substantial energy losses—anywhere between 20 and 40% of the energy is lost.[57] **Because of this inherent inefficiency, green hydrogen will always be a considerably more expensive fuel than renewable electricity**.[58] Not only is energy lost in the process of making green hydrogen, but equipment that uses green hydrogen is often less efficient than its competitors. A comparison of space heating technologies in buildings provides a good example of the efficiency advantages of using renewable energy directly as electricity instead of converting it to hydrogen. Hydrogen-based, low-temperature heating systems consume 500 to 600% more renewable energy than heat pumps.[59] Heat pumps can use renewable electricity on the power grid directly and efficiently. Analysts describe heat pumps

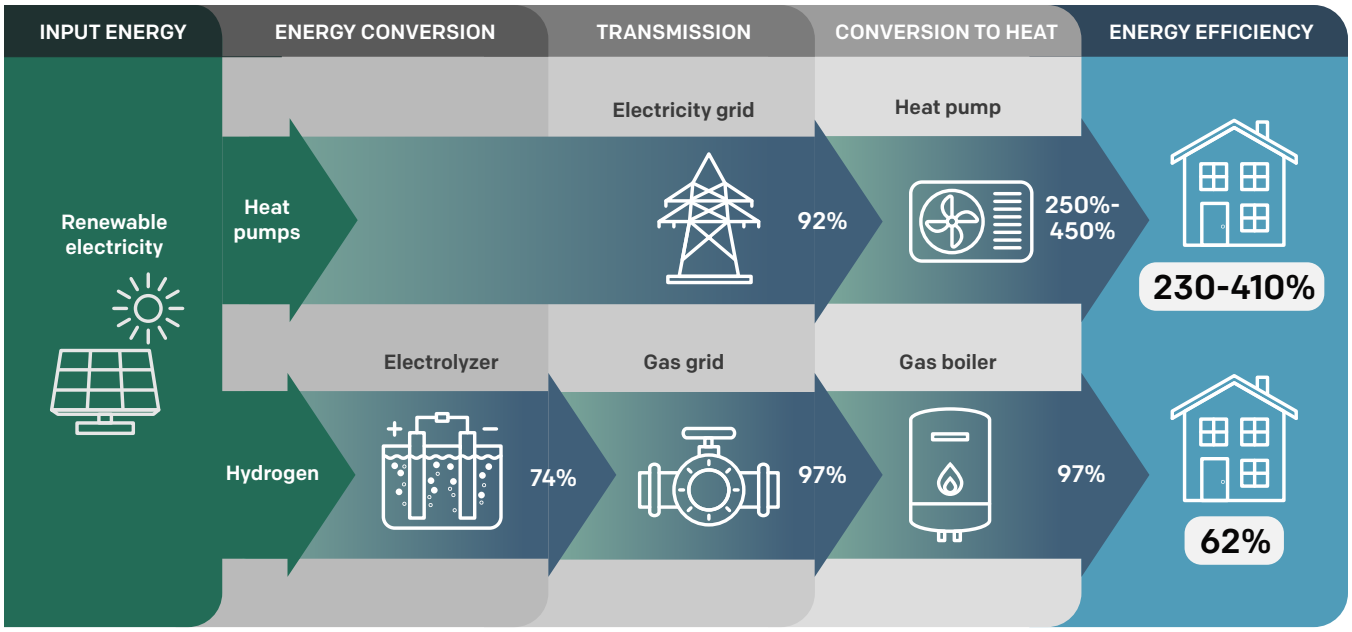


Figure 5: Comparison of efficiencies for hydrogen and heat pumps in homes

Data source: Ed Reed, *Hybrid hydrogen heating hopes*, Cornwall Insight Ireland (Nov. 29, 2018), https://www.cornwall-insight.com/uploads/CoTW%20Hydrogen_MH.pdf.

as having efficiencies greater than 100% because they transfer ambient heat, rather than combusting fuel to create it. Ultimately, heat pumps deliver warm air and hot water 3 to 5 times more efficiently than conventional furnaces and water heaters. As a result of their superior efficiency, heat pumps are cheaper to operate than equipment that burns fossil gas or equipment that burns green hydrogen, and even provide upfront capital cost *savings* when replacing the combination of a gas furnace and air conditioner (since heat pumps can provide both functions).[60]

Because electrolysis is so energy intensive, achieving substantial volumes of green hydrogen for any major economic sector would require enormous amounts of renewable electricity. Just deploying enough clean energy to eliminate emissions from the electricity sector by 2035 will be a titanic effort, requiring a six-fold increase over historic rates of renewable energy deployment, even if demand for electricity were static.[61] Transitioning to electric vehicles and ditching gas appliances for efficient electric technologies will dramatically increase demand for electricity and the need for new renewable resources.[62] Meeting the global demand for green hydrogen that one industry group predicts in 2050 could require the build out of solar resources that cover more than 81,250 square miles.[63] This is a land area larger than the state of Minnesota. Using green hydrogen in segments that can use direct electricity would exacerbate the challenge of deploying sufficient renewable resources by wasting renewable capacity on energy-intensive electrolysis.[64]

Costs

Currently, conventional fossil hydrogen costs between $1.25/kilogram and $2/kilogram in the United States,[65] while green hydrogen costs between $2.50/kilogram and $4.50/kilogram.[66] Three sets of analysts — BloombergNEF, Wood Mackenzie, and McKinsey — have recently found that green hydrogen could become cost-competitive by 2030 as economies of scale drive down the cost of electrolyzers and the price of wind and solar power continues to fall.[67] The Biden administration has announced a goal of reducing the cost of green hydrogen by 80% by 2030, indicating that federal policy might help achieve price reductions even greater than what analysts have predicted by the end of the decade.[68] The biggest influence on the cost of renewable hydrogen is the cost of the clean electricity that powers its production. Low-cost green

hydrogen requires abundant, low-cost, renewable energy.[69] Increasing total deployment of renewable energy is therefore a precondition for economically producing appreciable amounts of green hydrogen.

It is important for policymakers to consider long-term cost forecasts for green hydrogen when considering permits for new gas-fired facilities if developers claim the new fossil fueled infrastructure could be retrofitted to run on green hydrogen. For example, a company that recently proposed a new gas plant in Newburgh, NY estimated that hydrogen in 2040 will cost $45/MMBtu in nominal dollars.[70] In contrast, the most recent Energy Information Administration 2020 Annual Energy Outlook projects natural gas to cost well below $4/MMBtu in 2040 (in 2019$) in its Reference Case.

To have hydrogen replace the energy supply of fossil gas in the global economy would require building 3 to 4 times more storage and pipeline infrastructure.

Fuel costs would be even greater for blends of green hydrogen and zero-carbon methane, as the production of "synthetic methane" involves first making green hydrogen and then using the hydrogen as an input into another chemical process. Yet, some industry members and policymakers have contemplated using blends of green hydrogen and synthetic methane in residential and commercial appliances, which were designed to burn methane and cannot safely burn pure hydrogen.[71] A report prepared for the California Energy Commission finds that "[e]ven under optimistic cost assumptions, the blended cost of hydrogen and synthetic natural gas is 8 to 17 times more expensive than the expected price trajectory of natural gas."[72] The high costs of these gases make it difficult for gas-burning appliances to compete against electric options in a zero-carbon future. The inefficiency of converting clean electricity into hydrogen (let alone synthetic methane) before using its energy will always make it more costly than plugging directly into the electric grid.

Pollution from combustion

Burning hydrogen creates health-harming pollution. Proponents of hydrogen will often note that hydrogen fuel cells only emit water vapor, but many potential applications for hydrogen involve combustion rather than fuel cells. Hydrogen combustion's most significant public health threat is oxides of nitrogen (NOx), a pollutant that damages heart and respiratory function, impairs lung growth in children, and leads to higher rates of emergency room visits and even premature death.[73] NOx is a precursor to both ambient ozone and fine particulate matter pollution,[74] and also contributes to climate change.[75] One group of researchers predicted that **burning pure hydrogen would emit more than six times as much NOx as burning methane**, the main component in fossil gas.[76] NOx emissions could be reduced through advances in pollution control technology or by lowering flame temperatures, but this requires either lower volumes of hydrogen in the combustor (and consequently, increased reliance on fossil fuels) or de-rating the engine which results in efficiency losses and power decreases.[77] Industry should not be allowed to increase hydrogen combustion without first demonstrating control technologies that will avoid increases in NOx emissions. In 2018, air pollution from fossil fuel combustion was linked to roughly 355,000 premature deaths in the United States—pollution that African Americans were exposed to at a rate 1.54 times that of the overall population.[78] As long as combustion continues, proposals to reduce greenhouse gases by displacing some or all of the fossil fuels with hydrogen will not alleviate the uneven burdens of air pollution, and may even worsen them.

Safe transport and storage

Today, the majority (around 90%) of hydrogen in the United States is produced at or adjacent to where it is used (either onsite by petroleum refineries that use it themselves, or by nearby gas companies that deliver it by pipeline).[79] Transporting hydrogen is expensive due to its low energy density, which means that large amounts of space are required to hold a relatively modest amount of hydrogen energy. By way of comparison, to have hydrogen replace the energy supply of fossil gas in the global economy would require building 3 to 4 times more storage and pipeline infrastructure.[80]

Safely transporting, storing, and handling hydrogen can add significant costs. For instance, it only costs a few dollars per kilogram to produce hydrogen from fossil gas, which is how most hydrogen is produced today in California and across the United States. Yet the average retail price of hydrogen at fueling stations in California is about $16.50 per kilogram—the equivalent of about $6.40 per gallon of gasoline.[81]

Precautions against leaks are also necessary at each stage of handling hydrogen. Containing hydrogen is more challenging than containing other gases because hydrogen is the smallest and lightest molecule in the universe; 50,000 molecules of hydrogen gas can fit in the width of a human hair.[82] It is also extremely flammable, making it susceptible to combust even in small concentrations.[83] Deliberate steps are necessary to detect leaks because hydrogen is a colorless and odorless gas.[84] Leakage could diminish the climate benefits of a transition to green hydrogen because hydrogen itself is a greenhouse gas that is more than five times more potent than CO_2.[85]

The three main ways of transporting hydrogen are by pipelines, trucks or rail, and ships, each of which would require massive investments in new infrastructure to transport hydrogen at scale:

(1) **Pipelines:** Pipelines are the most cost-effective means of transport. Hydrogen pipelines today are very limited; there are only about 1,600 miles of dedicated hydrogen pipelines in the United States—mostly clustered in Southern California and along the Gulf Coast in Texas and Louisiana near refineries and chemical plants. Building a hydrogen pipeline can cost up to 68% more per mile than a conventional fossil gas pipeline.[86] **It is important not to confuse hydrogen pipelines with the United States' vast network of gas pipelines that were designed to deliver methane because these fossil gas pipelines cannot carry meaningful volumes of hydrogen. Hydrogen's size and energy density make it incompatible with generic pipeline materials and compressor designs**.[87] Hydrogen can cause "embrittlement" in pipes and its higher flammability and leakage rates create safety risks.[88] Conventional gas pipelines do not have systems for detecting leaks of hydrogen.[89] Thus, the lowest cost manner of transporting pure hydrogen would require massive investments in dedicated pipeline networks.

(2) **Trucks and rail:** Hydrogen can also be transported in high-pressure tube trailers on trucks or rail cars. Compression in tube trailers is expensive, however, and is only suitable for small volumes over short distances of 200 miles or less.[90] Unless the trucks used to

CAN WE RETROFIT EXISTING PIPELINES TO CARRY PURE HYDROGEN?

The first question to ask if the fossil fuel industry claims it can use existing gas infrastructure to deliver hydrogen is whether they are talking about pipelines that deliver gas to homes and commercial businesses. These "distribution" pipelines *cannot* be retrofitted to deliver pure hydrogen. The gas-burning appliances in homes and commercial buildings cannot burn hydrogen without an unacceptable risk of explosion. For insights into industry arguments for blending small amounts of hydrogen into distribution pipelines, see Section IV.

In contrast, the "transmission" pipelines that carry fossil gas from production centers to storage facilities and industrial users could conceivably be retrofitted to carry pure hydrogen. This retrofit would require significant costs, including replacing all of the pipeline's compressors.

transport the hydrogen are themselves zero-emission, then this comes with significant air pollution and greenhouse gas impacts of diesel combustion.

(3) **Ships:** For longer, intercontinental transport, hydrogen could be liquefied and transported by ship. Ships could transport relatively large volumes of liquid hydrogen, but liquefaction is expensive, and requires energy-intensive (and costly) chilling of hydrogen (to -252°C). Alternatively, ships can carry ammonia (they already do) as an energy carrier (ammonia is NH_3—meaning it carries three hydrogen molecules for each molecule of nitrogen). But if hydrogen is ultimately the desired commodity at its destination, this requires costly and energy-intensive re-conversion at the point of use.

The low energy density of hydrogen presents similar challenges for hydrogen's storage. Kept in a gaseous state, hydrogen storage requires large amounts of space. The cheapest solution is geologic salt caverns, which could store weeks' or months' worth of hydrogen, but these are geographically limited.[91] Pressurized containers could in theory be built anywhere, but their footprint and cost would limit them to small (days' worth) volumes.[92] To shrink hydrogen's footprint, it can be cooled and compressed to a liquid state, or converted to ammonia, but these present the same temperature and energy conversion loss challenges as shipping, mentioned above.[93] All storage options present risks, which planners should evaluate on a case-by-case basis.[94]

Water use

Electrolysis uses freshwater as a feedstock and is thus a significant source of freshwater demand. Producing one kilogram of green hydrogen requires between 9 and 11 liters of water as a feedstock.[95] Because additional water is also required for system cooling, total water demand can be between 15 and 20 liters of water for each kilogram of green hydrogen.[96] On a global basis, the water demand for electrolysis is far less than the water requirements for extraction and processing of fossil fuels. Still, climate change will constrain global freshwater resources in significant ways—e.g., by increasing evaporation and droughts, altering precipitation patterns, melting freshwater stored in glaciers, and contaminating aquifers with saltwater from rising sea levels.[97] These impacts will mean water-stress will both expand and intensify. Regions with the potential to produce low-cost, abundant green hydrogen may intersect with areas of water-stress, presenting localized resource challenges. For example, many of the most-often discussed "solar-hydrogen superpowers" are in regions with high insolation like North Africa, the Middle East, and the U.S. Southwest—all regions with extreme drought risk.[98] Some researchers are exploring ways to use low-grade and saline water for electrolysis, which could open more opportunities for green hydrogen production in regions facing water scarcity.[99]

Time

Today, less than 1 percent of hydrogen is produced through electrolysis and less than 0.02% is entirely produced from renewable electricity (i.e., green hydrogen).[100] **Dramatic reductions in climate pollution cannot wait until the 2030s, when we expect to see significant cost declines and increased availability for green hydrogen**. Maintaining a reasonable chance of limiting warming to 1.5° C requires more than half of global emissions reductions to happen before 2030—a commitment the Biden administration made in its latest submission of the United States' Nationally Determined Contributions under the Paris Agreement.[101] In reality, for wealthy nations like the United States, which is also the largest historical emitter of greenhouse gases, even steeper and earlier reductions must be made, since poorer nations will require more time and carbon budget to develop.[102] To reduce emissions as rapidly as possible, mitigation must take full advantage of solutions that *already* exist and can be quickly deployed starting today.

The urgent need for near-term reductions means we cannot afford to wait for the commercial availability of green hydrogen to decarbonize sectors that already have decarbonization tools.

IV IDENTIFYING THE PROMISING APPLICATIONS FOR GREEN HYDROGEN

This section explores the potential for various sectors to use green hydrogen as a cost-effective decarbonization tool. Below, we have sorted different applications in terms of their suitability for decarbonization with green hydrogen, using basic questions that policymakers can apply to any sector or potential hydrogen project. As a general principle, policymakers should never delay deployment of cost-effective decarbonization tools that are available today based on the hope that green hydrogen might become available in the future.

1. LEAST-REGRETS USES FOR GREEN HYDROGEN

Displace fossil hydrogen in current uses as an industrial feedstock

As discussed in Section I, industry currently produces so much hydrogen from fossil fuels that hydrogen production is a significant climate threat. Green hydrogen could avoid these emissions without requiring new technologies for hydrogen use. Industrial clusters that have hydrogen customers grouped in a small geographic footprint would allow for supply to be delivered by dedicated pipeline (the cheapest mode of delivery), and leverage existing storage infrastructure.

As the energy transition proceeds, demand for oil refining and chemical fertilizer production should decrease: sustainable and zero-emission transportation would reduce reliance on petroleum, and sustainable practices would reduce reliance on chemical agriculture inputs. In the next decade, while oil refining is required to meet increasingly stringent fuel specification standards, hydrogen demand may grow in the refining sector, and it would be a win for both the climate and public health if these inputs are instead supplied by green, zero-emission hydrogen. However, the potential for green hydrogen to displace fossil hydrogen cannot be a justification for expansion of refineries or chemical fertilizer plants. It should only be considered as a clean feedstock for existing, polluting systems that must rapidly wind down to meet climate and environmental justice objectives.

2. SECTORS TO EXPLORE WITH CAUTION

Maritime shipping

Global maritime transport accounts for roughly 3% of global greenhouse gas emissions, and is responsible for roughly 15% of global emissions of sulfur oxides and nitrogen oxides—pollution that disproportionately harms public health in port-adjacent communities.[103]

Inland vessels, ferries, and other smaller ships sailing shorter distances can already be powered using batteries and operate with zero-emissions.[104] The unexpected pace of technological progress in batteries has even led companies to begin building and piloting battery-powered zero-emission tankers and container vessels.[105] Given challenges to recharging batteries that need to cross thousands of miles of ocean, however, reliance on liquid fuels in international voyages is unavoidable for the foreseeable future.

Recent reports identify green hydrogen and green hydrogen-derived ammonia as a promising path to decarbonizing ships with longer voyages.[106] Green ammonia (derived from green hydrogen plus nitrogen in the atmosphere) is viewed as slightly more promising because it is easier to store and requires less space than pure green hydrogen for a given energy content.[107] If used in internal combustion propulsion systems, ships burning green hydrogen or ammonia will still emit air pollutants such as NOx (and unburned ammonia—a pollutant that is toxic to both humans and aquatic life).[108] To reduce air pollution, green ammonia or hydrogen should be used in fuel cells, a solution that is less established than combustion engines but is being piloted for some long-voyage vessels.[109]

		Are there currently technologies for using hydrogen in this sector?	Would use of green hydrogen require significant investments in hydrogen transportation and storage?	Are lower-cost decarbonization strategies available for this sector today?	Is green hydrogen likely to be necessary to decarbonize this sector?	Air pollution impacts of transition to green hydrogen
LEAST-REGRETS USES FOR GREEN HYDROGEN	Displace fossil hydrogen currently used as an industrial feedstock	Yes	Not if green hydrogen is produced on-site.	No	Yes	A transition to green hydrogen would avoid air pollution from current hydrogen-production practices.
EXPLORE WITH CAUTION	Maritime shipping	No	Yes	No	Yes	A transition to green hydrogen or green ammonia would reduce emissions from vessels, especially if they used fuel cells.
	Aviation	No	Yes	No	Yes	Potential for emissions reductions if planes use green hydrogen in fuel cells, rather than burning hydrogen.
	Industrial processes that require heat above 400°C (such as steel production)	Requires case-specific analysis	Yes	Partially	Maybe	Depends on what fuel the green hydrogen would displace. If a facility is currently burning fossil gas, a transition to green hydrogen combustion will not reduce (and may increase) NOx emissions.
	Long-term storage of renewable electricity paired with fuel cells	Yes, fuel cells that can deliver stationary power exist and are in operation around the world today.	Yes	No. Current technologies enable us to cost-effectively achieve 90% clean energy on the electric grid by 2035, but do not offer solutions for long-term storage of renewable energy.	Maybe. It is unclear what technology will emerge as the most cost-effective tool for long-term storage of renewable electricity.	Green hydrogen using fuel cells can eliminate on-site air pollution.
	Long-haul trucks and trains	Fuel cells are commercially available, but are still being piloted and tested for long-haul trucking in the United States (>200 miles a day) and line haul locomotives (cross country).	Yes	Partially	Maybe. Battery-electric and overhead catenary systems are the two primary alternatives for zero-emission long-haul transportation. Hydrogen fuel cells may be able to outcompete the demand for batteries and high-capacity charging for long, heavy-duty hauls, and the infrastructure costs of overhead lines.	A transition to green hydrogen fuel cells would avoid health-harming tailpipe emissions.
REJECT THE HYDROGEN HYPE	Combusting hydrogen in new, existing, or expanded fossil gas power plants	Current turbines can handle small amounts of blended hydrogen, but running on pure hydrogen requires yet to be demonstrated modifications.	Yes	N/A. However, unsubsidized solar and wind, even when paired with batteries, are much cheaper than gas plants running on even modest blends of hydrogen, which would have minimal greenhouse gas reduction benefits.	No, gas plants are best decarbonized by being decommissioned.	Hydrogen blends running in gas turbines are likely to increase NOx pollution.
	Industrial processes that require heat below 400°C (e.g., food and beverage processing, packaging, textile, and some chemicals processing)	No	Depends on facility	Yes	No	Burning hydrogen would cause more air pollution than electric alternatives.
	Gas-burning appliances in homes and commercial buildings	Gas-burning appliances can tolerate some blending of hydrogen into the gas mixture, but it is unclear how much.	Yes	Yes	No	Indoor air pollution would continue and may worsen.
	Cars, buses, and short- haul trucks	Yes	Yes	Yes	No	Like battery-electric vehicles, fuel cell vehicles have no tailpipe pollution.

Figure 6: Evaluating potential applications for green hydrogen

These paths are preferred to both biofuels, which a World Bank report dismisses as "highly unlikely to be available at sufficient scale and to be sufficiently cost-competitive" and synthetic carbon fuels, which they conclude "involves multiple energy-intensive steps which leads to poor energy efficiency."[110]

Aviation

Aviation emits more than 2% of global CO_2 emissions and is expected to rapidly rise.[111] Like maritime shipping, the aviation sector may not be able to rely on widespread electrification to eliminate emissions, given the limitations of batteries and charging for long-haul routes. Independent experts have identified using renewable electricity to produce hydrogen or kerosene (derived from green hydrogen) as a potential path to decarbonizing aviation, with some companies already piloting its potential for short-haul flights under 500 miles.[112] Some startups are investigating the potential for hydrogen-powered aviation, with some developing hydrogen "capsules" that would be interchangeable, and will be piloted in aircrafts powered by fuel cells capable of regional flights up to 700 miles, with a goal for actual flights by 2025.[113]

High-heat industrial processes

Green hydrogen may play an important role in decarbonizing high-temperature industrial processes, such as steel production, that do not have electric decarbonization options. Steel production is an industry for which green hydrogen is an especially attractive decarbonization strategy because green hydrogen could provide both high-temperature heat and replace coking coal in the iron-ore reduction process. Meanwhile, many industrial processes use temperatures well within the range of lower-cost alternatives. Electric heat pumps will probably be the most cost-effective option for decarbonizing industrial processes that require heat up to 400°C.

Currently, about 40% of gas used for industrial heat is for temperatures less than 100°C—like for food, beverage, and textile processing, packaging, and some chemicals processing.[114] Even for higher temperature heating demands, other electricity based options are commercially established (e.g., electric arc furnaces, resistance, microwave and plasma heating). Electric arc furnaces are now used in some steel production and can reach temperatures up to 3500°C.[115]

Long-haul trucks and trains

Hydrogen fuel cells are already in use in the transportation sector, but they are significantly more expensive, and would require significantly more renewable electricity, than battery-electric vehicles.[116] These constraints limit their potential to segments of the surface transportation sector where, like shipping and aviation, batteries are not soon expected to achieve necessary energy density or refueling needs for long, heavy-duty hauls. Locomotives that carry heavy freight across the country, for example, need so much energy that an entire rail car of batteries might be required where catenary or other electrified rail infrastructure is not feasible,[117] and some worry that battery weights could penalize the payload of long-haul trucks (though jurisdictions like California and Europe have passed additional zero-emissions vehicle weight allowances).[118] While some analyses show that the current and rapidly advancing state of battery cost and performance will overcome these concerns, the need for high energy density and fast refueling times makes hydrogen fuel cells a potential solution for these surface transportation segments.[119] A few truck manufacturers continue to explore hydrogen fuel cells for long-haul trucks,[120] and hydrogen fuel cells are being used to displace diesel engines in some locomotives.[121]

Long-term storage of renewable electricity paired with fuel cells

The near-term focus for decarbonizing the electric grid should be dramatically increasing deployments of renewable resources and batteries—the mature technologies that can cost-effectively supply 80% of the United States' electricity by 2030 and 90% of electricity by 2035.[122] Achieving a zero-carbon grid will require a variety of energy storage technologies that can store renewable energy over different time scales. Green hydrogen's advantage is that it could economically store renewable energy for long periods of time with minimal energy

loss.[123] It is unclear whether green hydrogen will be able to compete against other long-term energy storage technologies, such as compressed air and electrochemical storage.[124]

Importantly, fuel cells do not present the substantial air pollution concerns that come with combustion turbines, because fuel cells only emit water vapor.

Fuel cells would be the appropriate technology for re-converting green hydrogen into electricity. Most importantly, fuel cells do not present the substantial air pollution concerns that come with combustion turbines because fuel cells only emit water vapor.[125] Further, fuel cells can operate at higher efficiencies (up to 60%) than combustion power plants (about 40%).[126] Fuel cells can be sited in urban settings near the customers who rely on them because they are quiet and do not emit air pollution, helping to reduce expensive investments in the transmission system and the risk of power outages when transmission lines fail.[127] Fuel cells are an established and commercially available technology, unlike burning pure hydrogen in power plant turbines. And because fuel cells rely on the same principal processes as electrolyzers (they are essentially electrolyzers that work in reverse) they are likely to benefit from the expected cost declines that will come from increased investment in green hydrogen.

The main drawback of fuel cells is that they tend to have smaller energy capacity compared to combustion turbines and have initially been limited to meeting smaller energy demands. But this is changing—fuel cells can provide power for systems as large as utility power stations, and groups of modular fuel cell systems have been joined to create small power plants up to 63 MW in size.[128] While the larger deployments of solar and wind necessary to generate surplus renewable energy continue to be scaled, higher capacity fuel cell technology and costs are likely to improve. In the meantime, it is important that policymakers and energy system planners seek ways to prioritize their deployment in place of alternatives that would rely on combustion and its corresponding air pollution.

3. SECTORS WHERE HYDROGEN IS NOT A SOLUTION

In these sectors, there are unique and likely insurmountable challenges to cost-effectively deploying green hydrogen, in addition to the cross-cutting challenges described in Section II. Please see page 18 for information about the infrastructure needed to safely transport and store hydrogen and page 17 for information about the deployments of wind and solar resources that will be necessary to drive down the cost of green hydrogen.

Combusting in fossil gas power plants

Several entities have supported proposals for investments in gas-fired power plants with claims that their new fossil fuel infrastructure could one day transition to burning green hydrogen.[129] These proposals often lack meaningful consideration of the substantial barriers to retrofit a gas plant to wholly or even partially run on green hydrogen. The project proponents' vague claims about hydrogen are likely a tactic for dismissing climate and public health concerns about expanded fossil fuel reliance.

There are no commercially available power plant turbines now that can burn pure hydrogen. Without this technology, even power plants that have access to green hydrogen will continue to burn a mixture of hydrogen and fossil gas. Even burning a gas blend with 50% green hydrogen and 50% methane would require industry to overcome significant obstacles. Hydrogen's energy density (one-third of fossil gas), molecular size (the smallest of all molecules), flammability, and flame speed (an order of magnitude faster than fossil gas)[130] all pose challenges to retrofitting gas plants to run on green hydrogen, which scale with increasing concentrations of hydrogen in the power plant's fuel blend. Beyond the turbine itself, running a gas turbine on pure hydrogen requires different fuel delivery piping and components; different gas turbine controls, ventilation systems, and enclosures; and different selective catalytic reduction systems for

THE INTERMOUNTAIN POWER PROJECT

The project with the most advanced plans for transitioning to green hydrogen is the Intermountain Power Project in Utah. This facility has access to underground salt caverns for storing hydrogen, which do not exist in most parts of the country, and abundant renewable generating capacity as well as existing transmission lines. This intersection of low-cost storage, delivery, and energy capacity conditions is likely to be extremely limited across the United States.

NOx removal.[131] Many of these are also needed for high blends of hydrogen mixed with traditional gas.[132]

Even if logistical challenges can be overcome to allow gas-fired power plants to burn a gas blend with even 30 to 50% green hydrogen, this feat will have a modest effect on greenhouse gas emissions. For example, a 30% hydrogen blend would only achieve a 12% CO_2 reduction. This is because of hydrogen's low energy density, which means that large volumes of hydrogen deliver less energy than the methane in fossil gas.

The air quality impacts of combustion turbines will not only persist if they transition to hydrogen, but will worsen absent satisfactory advances in emission control technology. Indeed, it is unclear if and when industry will develop turbines that can burn hydrogen without violating air quality standards. Transitioning to hydrogen-burning turbines threatens to increase air pollution because hydrogen burns at a higher temperature than methane. A study conducted by General Electric on its combustion turbines found that a 50/50 mixture of hydrogen and fossil gas (by volume) increased concentrations of NOx in gas exhaust by 35 percent.[133] A recent report by a gas turbine industry association warned that these higher flame temperatures will produce more health-harming NOx emissions "if no additional measures are undertaken."[134] The industry association recommended that "[s]ome flexibility might be needed on NOx limits," noting that complying with pollution standards will be even more challenging if governments adopt the stronger NOx limits it foresees in the future.[135] For these reasons, regulators should not allow any increases in hydrogen blending without

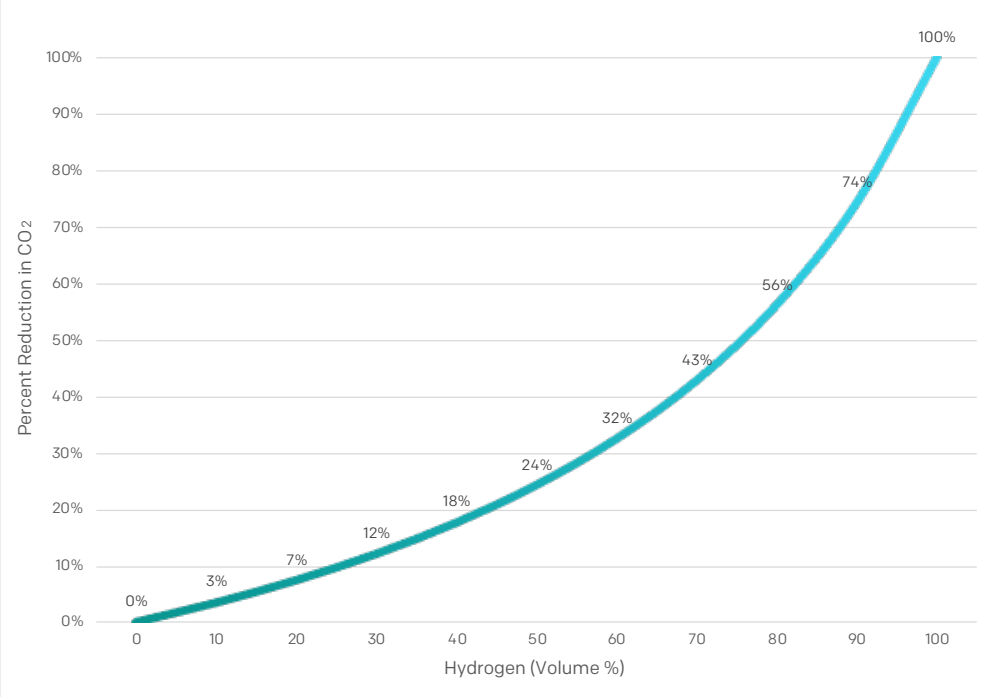


Figure 7: Relationship between CO_2 emissions from combustion and hydrogen/methane fuel blends (volume %)

GREENWASHING SPOTLIGHT

Danskammer Energy LLC is proposing to build a new 636 MW fossil gas combined cycle plant in the Town of Newburgh, New York. Under the Climate Leadership and Community Protection Act ("CLCPA"), New York has committed to achieving ambitious greenhouse gas reductions by 2030 and 2050, 70% renewable electricity by 2030, and a zero-emission electricity sector by 2040. Danskammer maintains that its proposed fossil gas plant will comply with state law because the proposed plant could theoretically someday convert to operation on hydrogen or another zero-carbon fuel and has floated the possibility of a hydrogen pilot study post-construction. However, the Company does not explain—and does not appear to know—how operating the proposed plant on hydrogen would actually work, including where the hydrogen might come from and how it would be transported to and stored on-site. When asked for additional details, Danskammer conceded that it is not proposing to operate on green hydrogen as part of the project under review, basic details on the potential hydrogen pilot project are not available at this time, and further approvals would be necessary in connection with any proposal to operate on hydrogen. Unsurprisingly then, Danskammer does not commit to a hydrogen transition and does not even plan to develop a scope for any pilot study until sometime after its proposed plant is approved to run on fossil gas. Moreover, after reviewing Danskammer's application for a facility air permit, the Commissioner of the New York State Department of Environmental Conservation tweeted that the application does not justify the project or show compliance with the CLCPA.

Source: Basil Seggos, https://twitter.com/basilseggos/status/1410334434595946496.

reviewing the adequacy of a facility's emission controls and establishing an emissions monitoring program. Regulators should set specific limits on a facility's NOx emissions during startup periods; gas turbine NOx emissions often spike before their pollution controls warm up and a transition to hydrogen could exacerbate these spikes of uncontrolled emissions. This is a public health concern for residents living near such a facility and especially in non-attainment areas, which may potentially increase the disparate impact many fence-line communities already bear in this country. Without sufficiently improved pollution control technology, another alternative would be to lower the flame temperature by "derating" the turbine, which means that the unit would not operate at its full nameplate capacity.[136] This strategy could increase the risk of power outages if grid planners had assumed these plants will be able to perform at capacity when needed.

Water use is another environmental burden that will persist regardless of whether combustion turbines transition to green hydrogen. Fossil-fueled power plants are the nation's top user of fresh water and demand tremendous amounts of water for cooling. As the climate changes, there will be less fresh water available to cool these power plants—putting their continued operation at risk.[137]

Finally, policymakers should not permit the buildout of new gas-fired power plants under the assumption that it will be economical to operate these facilities with green hydrogen. As mentioned above, a company that recently proposed a new gas plant in Newburgh, New York estimated that hydrogen in 2040 will cost $45/MMBtu in nominal dollars.[138] In contrast, the most recent Energy Information Administration 2020 Annual Energy Outlook projects

natural gas to cost well below $4/MMBtu in 2040 (in 2019$) in its Reference Case.[139]

Gas-burning appliances in homes and commercial buildings

Burning fossil fuels to keep us warm in the winter, heat our water, and power other appliances collectively contributes about 10% of the nation's greenhouse gas emissions.[140] Climate policy poses an existential threat to America's gas companies because the most cost-effective way to tackle these emissions is by transitioning from appliances that burn fuel to electric appliances that run on a decarbonized power grid.[141] In the face of this threat, hydrogen has emerged as a new tool for the gas industry to sow confusion and combat measures that would help homes and businesses transition to electric appliances.

Multiple independent studies show that there is a weak economic case for deploying green hydrogen in buildings through the gas distribution grid.[142] The main reason is the superior efficiency of heat pumps, which use small amounts of renewable electricity to move ambient heat to where it is needed. One recent Pacific Gas & Electric Company-funded study found that California could save $20 billion by choosing a high electrification pathway instead of relying on renewable gases like hydrogen and synthetic methane in buildings.[143] Heat pumps for space and water heating are not only the cheapest of all zero-carbon options—in many instances, their superior efficiency means they will yield cost savings relative to conventional gas-based heating systems.[144]

There are several reasons why green hydrogen is a bad fit for addressing the pollution from gas-burning appliances:

(1) **Injecting green hydrogen into the gas system could require significant investments into a system that was not designed for hydrogen**. In California, the regulated gas utilities have proposed a pilot project to study how much hydrogen they might safely inject into the gas distribution system, and under what conditions. The utilities identified numerous potential safety and reliability risks they intend to study. For example, the elastomers and rubbers that seal many pipeline components can swell or develop voids after exposure to pure hydrogen; hydrogen can cause embrittlement of steel pipes; and the utilities do not know how much hydrogen they can

BEWARE THE HYPE AROUND HYDROGEN BLENDS

Southern California Gas Company and San Diego Gas & Electric Company brag in press releases about proposing "groundbreaking" research that could allow them to deliver gas with an "industry-leading" 20% hydrogen blend, calling it a "key milestone in our efforts to decarbonize our energy system."* If these companies find a way to safely deliver a gas mixture that is 20% green hydrogen and 80% fossil gas, their gas will still be a major climate threat. Because of hydrogen's low energy density, burning a gas blend with 20% green hydrogen will only reduce carbon dioxide emissions by about 7%. This is close to the ceiling for how much hydrogen the gas companies could deliver to homes and businesses before creating an explosion risk in gas-fired residential appliances, which is around 25% hydrogen.**

* Southern California Gas Company & San Diego Gas & Electric Company, *SoCalGas and SDG&E Announce Groundbreaking Hydrogen Blending Demonstration Program to Help Reduce Carbon Emissions* (Nov. 23, 2020), https://www.prnewswire.com/news-releases/socalgas-and-sdge-announce-groundbreaking-hydrogen-blending-demonstration-program-to-help-reduce-carbon-emissions-301178982.html.

** Jeff St. John, *Green Hydrogen in Natural Gas Pipelines: Decarbonization Solution or Pipe Dream?*, Greentech Media (Nov. 30, 2020), https://www.greentechmedia.com/articles/read/green-hydrogen-in-natural-gas-pipelines-decarbonization-solution-or-pipe-dream.

safely store in the underground formations that they rely on for gas storage. Because hydrogen molecules are much smaller than methane molecules, utilities may also need to upgrade their infrastructure to prevent it from leaking into the atmosphere. When a pipeline carries a blend of hydrogen and methane, hydrogen can leak at three times the rate of methane.[145] Regulators should not let gas utilities force their captive customers to bear the costs of modifying pipeline infrastructure to carry hydrogen safely and with minimal leakage. It is unreasonable for resources to go toward hardening a gas system that has no role in a zero-emission future, rather than reserving resources for building electrification.

(2) **Even after blending in green hydrogen, the gas system hits a dead end as a decarbonization tool**. Regardless of whether retrofits could theoretically enable the gas system to deliver pure hydrogen to homes and businesses, local gas utilities could not do so. At most, gas utilities can blend limited amounts of hydrogen with methane because appliances that were designed for methane gas cannot safely burn pure hydrogen.[146] The most optimistic scenarios estimate that the gas system that serves homes and most businesses could only handle up to 20% hydrogen by volume—representing just 7% of the energy in the gas pipeline system because hydrogen is less energy dense than methane.[147] In that case, fully decarbonizing the gas system would require the gas utilities to procure enough renewable methane to supply the remaining 93% of energy need on the system. There is no feasible way to displace 93% of the country's fossil gas demand with non-fossil sources of methane. Even under the gas industry's "high resource potential" scenario, methane from landfills, animal manure, food waste, and water treatment facilities could displace less than 9% of the fossil gas this country currently uses each year.[148] The same report identifies various methods of creating additional methane that could displace up to 19.5% of America's gas consumption in its most aggressive scenario.[149] The gas industry's claims about the potential for supposedly "renewable natural gas" may be overly optimistic. A report by the Union of Concerned Scientists found that there is only enough potential biomethane supply to displace about 3% of California's fossil gas use.[150] Other sources of "renewable natural gas" are being studied, but are decades

BIOMETHANE

Biomethane—sometimes referred to as "biogas," "renewable natural gas," or "RNG"—is methane generated through the decomposition or gasification of organic matter. The most common sources of biomethane are landfills, animal manure from factory farms, wastewater treatment plants, forest and agricultural waste products, or crops grown for the specific purpose of converting into energy.

While gas utilities—often in partnership with industrial agribusiness—have promoted biomethane as a drop-in alternative to fracked gas, the actual supply of non-fossil gases is extremely limited. And despite the industry's branding of this gas as "renewable," much of it comes from sources that are highly polluting, and can perversely increase greenhouse gas emissions. The small fraction of biomethane that is genuinely sustainable to produce cannot justify anything close to the current gas distribution system, and is best allocated to niche, hard-to-electrify end uses.

For a more detailed look at the industry's misleading claims about biomethane, see Earthjustice's report with Sierra Club: *Rhetoric vs. Reality: the Myth of "Renewable Natural Gas" for Building Decarbonization*. Sasan Saadat et al., *Rhetoric vs. Reality: the Myth of "Renewable Natural Gas" for Building Decarbonization* (July 2020), https://earthjustice.org/report/building-decarbonization.

away from commercialization.[151] Even if a gas company could buy a blend of zero-carbon gas, the cost would be exorbitant—potentially 8 to 17 times the cost of natural gas.[152] Thus, the current and potential future supplies of non-fossil gases do not alter the imperative to quickly and dramatically reduce gas throughput.

(3) **Injecting hydrogen into the gas system does not eliminate—and may increase—the indoor air pollution from gas-burning stoves, furnaces, and other appliances**. Unlike electric appliances, all gas-burning appliances emit nitrogen oxides, pollution that contributes to respiratory and heart diseases.[153] Under the status quo, gas combustion for heating and cooking results in significant NOx pollution and other combustion byproducts that would be considered illegal if measured outdoors. Recent studies show that children growing up in homes with gas stoves have a 42% increased risk of developing asthma symptoms.[154] In their joint application to the California Public Utilities Commission to research the compatibility of hydrogen blends with their infrastructure, the California gas utilities acknowledged that blends of hydrogen and methane "may yield higher NOx emissions than natural gas because hydrogen burns faster than natural gas, which increases combustion temperatures and reduces ignition lag. . . . therefore, additional emissions testing should be completed with natural gas end-use equipment operating with hydrogen blends."[155] Regulators should not allow gas companies to inject hydrogen into their

GREENWASHING SPOTLIGHT

Across California, local governments have adopted policies that encourage new buildings to use all-electric appliances as a cost-effective strategy to reduce greenhouse gases. The nation's largest gas utility, Southern California Gas Company (SoCalGas), has repeatedly fought these commonsense measures by urging policymakers to instead consider the possibility that gas companies' infrastructure could deliver hydrogen and other so-called "renewable" gases. For instance, the company made the following argument in its attempts stop Ventura County from blocking the build-out of fossil gas infrastructure to new homes:*

> SoCalGas urges the County to consider other GHG emission-reduction strategies that are scalable and easier to implement, more resilient and more affordable. Specifically, the use of renewable gasses such as hydrogen and renewable natural gas (RNG), are low carbon to negative fuels that can dramatically reduce county greenhouse gas emissions and provide optionality and flexibility for the energy system.

This is self-serving hype from the gas company. Despite its vague claim that green hydrogen is "more affordable" and "easier to implement" than using all-electric appliances in new homes, SoCalGas has never revealed the potential cost of procuring green hydrogen and upgrading its infrastructure to handle hydrogen blends. Promoting the interests of its shareholders, SoCalGas is invoking the future potential of hydrogen to stop policymakers from choosing climate solutions that are cost-effective today.

* SoCalGas, Comment letter RE: County of Ventura – Draft 2040 General Plan Update EIR (Feb. 28, 2020) at 12.

distribution systems unless independent researchers find that doing so will not further degrade indoor air quality.

Cars, buses, and regional trucks

Green hydrogen is not an attractive technology for decarbonizing most vehicles on the road because battery-electric vehicle technology provides a straightforward path for cars, buses, and trucks. In the market segments where battery-electric and hydrogen options are available, the battery-electric options are cheaper to purchase and operate than their hydrogen competitors, even when the hydrogen vehicles run on less expensive hydrogen from fossil fuels.[156] By the mid-2020s, researchers expect many battery-electric vehicles to have an even lower cost of ownership than vehicles with internal combustion engines.[157] Battery-electric light-duty vehicles will likely reach upfront price parity with combustion engines between 2022 and 2024, at which point they will produce operational savings relative to conventional vehicles at no added cost.[158] Though manufacturers of fuel cell vehicles could reduce upfront purchase prices by scaling up production, the economics of fueling a battery-electric vehicle with renewable energy have inherent advantages over fueling a fuel cell vehicle with green hydrogen. Hydrogen cars require more than 2 to 3 times as much renewable energy as battery-electric cars because so much energy is lost in the process of compressing and transporting hydrogen and converting it into electricity in fuel cells.[159]

Some efficiency improvements are possible. Nonetheless, a recent study found that to meet climate goals, "in comparison to electric vehicles, hydrogen-based propulsion technologies will reach market readiness too late."[160]

Given the economic advantages of renewable electricity over green hydrogen as a vehicle fuel, fuel cell vehicles will likely only be viable in the shrinking market segments that lack battery-electric options. Even for long-haul trucking, where hydrogen was once thought to be necessary for decarbonization, battery-electric vehicles are emerging as a cost-effective and low-risk mitigation pathway thanks to rapidly improving battery technology.[161] Recent studies find that these dramatic improvements can render long-haul battery-electric trucks with 500-mile range both technically feasible and economically compelling.[162] About 80% of trucks travel less than 500 miles,[163] making battery-electric technologies the best option for the vast majority of trucks.

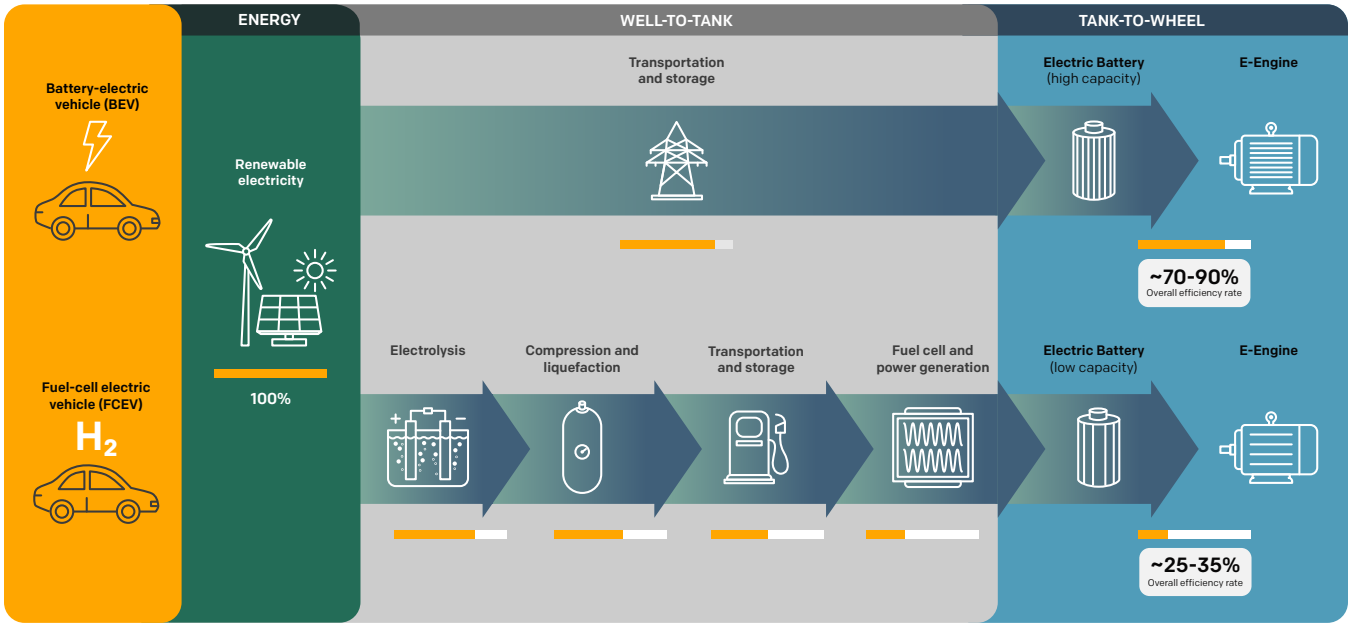


Figure 8: Comparing the efficiency of renewable energy in battery and fuel cell vehicles

Data source: Volkswagen (2020)

Recognizing the challenges for fuel cell vehicles, industry is rethinking investments in hydrogen. Scania, one of the world's largest truck and bus manufacturers, decided to end its fuel cell vehicle program because "three times as much renewable electricity is needed to power a hydrogen truck compared to a battery electric truck" and maintenance is more challenging for hydrogen vehicles than their battery-electric competitors.[164]

Volkswagen is also focusing on electric vehicles, with its chief executive officer declaring that "You won't see any hydrogen usage in cars. . . . Not even in 10 years, because the physics behind it are so unreasonable."[165] Likewise, Mercedes-Benz is ending its hydrogen car program because it could not scale up sales and production enough to make hydrogen cars cost-competitive.[166]

GREENWASHING SPOTLIGHT

Toyota is advertising its hydrogen fuel cell car, the Mirai, with the misleading claim that "[t]he more you drive, the more you clean air." The idea behind this claim is that the car's air intake has a filter that captures particulate matter and other impurities in the air before sending oxygen to its fuel cell. However, Toyota's ads ignore the emissions from producing hydrogen, even though almost all of the hydrogen in the United States is produced from fossil fuels through a process that releases significant health-harming pollution. Ultimately, these ads are likely to give consumers the false impression that they can help improve air quality by driving more often.

Source: TOYOTA MIRAI, Air Purification System (last visited July 30, 2021), https://www.youtube.com/watch?v=VX8p0mG7pLY.

CONCLUSION

Recently, hydrogen has captured the attention of the press and policymakers, partly because green hydrogen may become a climate solution for sectors that have long seemed out of reach for renewable energy. However, hydrogen hype is also flowing from industry trade associations that represent the oil and gas industry, which produce the vast majority of hydrogen in use today from fossil fuels. For the oil and gas industry and for other incumbents of the fossil energy system—like certain manufacturers of combustion vehicles, turbines, and boilers and companies that profit from building gas pipelines—hydrogen may offer a path to continued relevance and investment under potential climate policies.

While hydrogen can—and likely must—complement traditional renewables and electrification, policymakers should only promote hydrogen that is genuinely compatible with a zero-emission future. Today, more than 99% of the hydrogen that industry produces in the United States is made from fossil fuels through a process that emits massive amounts of health-harming pollution into neighboring communities. Appropriate investments in green hydrogen, which is made from renewable electricity, are no excuse for expanding or continuing hydrogen production that threatens the climate and public health.

Further, policymakers should understand the limits of green hydrogen's economic potential. Green hydrogen is not a useful tool for sectors that can decarbonize by transitioning to electric technologies and relying on a renewable power grid. It will always be more cost-effective to use renewable energy directly from the grid than to use green hydrogen; due to the inefficiency of converting renewable energy into hydrogen, powering equipment with green hydrogen requires several times as much renewable energy than doing the same job with clean electricity. Therefore, policymakers should focus on supporting green hydrogen in sectors that lack feasible electric options, such as maritime shipping.

Currently, industry trade associations are advocating for the use of a broad range of hydrogen sources and seeking public support for using hydrogen in sectors that have more cost-effective strategies for transitioning to renewable energy. Policymakers must carefully scrutinize these requests. The window to rapidly transition to a just, zero-emission energy system is narrowing. There is no time to waste with distractions or missteps. To chart a clear course, we must distinguish green hydrogen's true potential from fossil fuel industry spin, and reclaim it for a renewable future.

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EARTHJUSTICE


RIGHT TO
ZERO

SB-125 Public resources: geothermal resources: lithium. (2021-2022)

Date Published: 07/01/2022 02:00 PM

Senate Bill No. 125

CHAPTER 63

An act to add Article 3 (commencing with Section 2950) to Chapter 13 of Division 3 of the Fish and Game Code, to add and repeal Section 15570.32 of the Government Code, to amend Sections 2207 and 3823 of the Public Resources Code, and to add Part 25 (commencing with Section 47000) to Division 2 of the Revenue and Taxation Code, relating to public resources, and making an appropriation therefor, to take effect immediately, bill related to the budget.

[Approved by Governor June 30, 2022. Filed with Secretary of State June 30, 2022.]

LEGISLATIVE COUNSEL'S DIGEST

SB 125, Committee on Budget and Fiscal Review. Public resources: geothermal resources: lithium.

(1) The Salton Sea Restoration Act establishes the Salton Sea Restoration Fund, which is administered by the Director of Fish and Wildlife, and requires that the moneys in the fund be expended, upon appropriation by the Legislature, for environmental and engineering studies related to the restoration of the Salton Sea and the protection of fish and wildlife dependent on the sea, conservation measures necessary to protect the fish and wildlife species dependent on the Salton Sea, and the preferred Salton Sea restoration alternative, including administrative, technical, and public outreach costs related to the development and selection of that alternative, as specified. The act prohibits the expenditure of moneys in the fund for mitigation except for mitigation undertaken by the State of California.

This bill would create the Lithium Subaccount within the Salton Sea Restoration Fund, and would continuously appropriate moneys in the subaccount to the Natural Resources Agency for restoration projects and grants for community engagement, public amenity, capital improvement, or community-benefit projects at or around the Salton Sea and those communities impacted by the Salton Sea’s restoration and development, thereby making an appropriation. The bill would require the agency to develop and adopt project solicitation and evaluation guidelines before allocating those moneys. The bill would require the agency, on or before June 30 of each fiscal year, to report on its internet website the projected operating and maintenance costs of state-developed or -managed public works or restoration projects at the Salton Sea for the following fiscal year that will be funded through the subaccount.

(2) Existing law requires the owner or operator of a mining operation within the state, among other things, to annually report specified information to the Supervisor of Mine Reclamation. Existing law requires the State Mining and Geology Board to impose an annual reporting fee on each active or idle mining operation and to collect $5 per ounce of gold and $0.10 per ounce of silver mined within the state.

This bill would specify, for purposes of the above requirements, that “mining operation” includes the extraction of minerals from geothermal brine, or any other brine, including, but not limited to, a mining operation colocated or

co-operated with geothermal resource facilities. By expanding the operations subject to the tax on gold and silver mined in the state, the bill would impose a tax.

(3) Existing law creates the Geothermal Resources Development Account, requires revenues received by the state pursuant to a specified federal law to be deposited into the account, and continuously appropriates moneys in the account for specified purposes. Upon the receipt and deposit of revenues into the account, existing law requires 40% of the revenues derived from the sale of certain leases, and 40% of the revenues consisting of royalties and rents, to be immediately disbursed by the Controller to the county in which the United States has leased those lands for geothermal development, as specified. Existing law requires 30% of the revenues in the account to be available for expenditure by the State Energy Resources Conservation and Development Commission as grants or loans to local jurisdictions or private entities, as specified. Existing law requires that the revenues disbursed to counties and grants or loans made to local jurisdictions or private entities be expended by the recipient for specified purposes related to geothermal resources.

This bill would additionally authorize the expenditure of those revenues, grants, and loans for specified purposes related to the extraction of minerals from geothermal brines and related activities. By expanding the purposes of which moneys in a continuously appropriated fund may be expended, the bill would make an appropriation.

(4) Existing law imposes taxes upon income and real property, and taxes upon certain transactions and excise taxes. The Fee Collection Procedures Law provides procedures for the collection of certain fees and surcharges and is administered by the California Department of Tax and Fee Administration. Under existing law, a violation of the Fee Collection Procedures Law is a crime.

This bill would, beginning January 1, 2023, require any person who extracts lithium from geothermal fluid, spodumene ore, rock, minerals, clay, or any other naturally occurring substance in this state to pay a lithium extraction excise tax upon each metric ton of extracted lithium carbonate equivalent, as specified. The bill would provide that the tax is in lieu of all county, municipal, or district taxes on lithium extraction or lithium storage, except as provided. The bill would require that the tax revenues, less refunds and reimbursement to the department for its costs associated with the administration and collection of the tax, be deposited into the Lithium Extraction Excise Tax Fund, a continuously appropriated fund established by the bill. By establishing a continuously appropriated fund, and depositing moneys into the fund, the bill would make an appropriation. The bill would require the Controller to distribute 80% of the moneys in the fund to counties in proportion to the amounts of the taxes, interest, penalties, and other amounts collected for lithium extraction within each county and to deposit 20% of the moneys in the fund into the Lithium Subaccount described above. By depositing moneys into the continuously appropriated subaccount, the bill would make an appropriation.

This bill would require the department to administer and collect the tax pursuant to the Fee Collection Procedures Law. By expanding the application of the crimes associated with the Fee Collection Procedures Law, the bill would impose a state-mandated local program.

This bill would require the department, on or before December 31, 2023, to prepare a study of replacing a volume-based tax on the extraction of lithium with an equivalent tax based on gross receipts.

(5) The California Constitution requires the state to reimburse local agencies and school districts for certain costs mandated by the state. Statutory provisions establish procedures for making that reimbursement.

This bill would provide that no reimbursement is required by this act for a specified reason.

(6) This bill would appropriate $5,000,000 from the General Fund for allocation to the County of Imperial for specified purposes related to geothermal energy development and lithium extraction.

(7) This bill would declare that it is to take effect immediately as a bill providing for appropriations related to the Budget Bill.

(8) This bill would include a change in state statute that would result in a taxpayer paying a higher tax within the meaning of Section 3 of Article XIII A of the California Constitution, and thus would require for passage the approval of $^2/_3$ of the membership of each house of the Legislature.

Vote: 2/3 Appropriation: yes Fiscal Committee: yes Local Program: yes

THE PEOPLE OF THE STATE OF CALIFORNIA DO ENACT AS FOLLOWS:

SECTION 1. Article 3 (commencing with Section 2950) is added to Chapter 13 of Division 3 of the Fish and Game Code, to read:

Article 3. Lithium

2950. For purposes of this article, the following definitions apply:

(a) "Agency" means the Natural Resources Agency.

(b) "Disadvantaged community" has the same meaning as defined in Section 80002 of the Public Resources Code.

(c) "Nonprofit corporation" means a nonprofit corporation qualified to do business in California and exempt from taxation under Section 501(c)(3) of the Internal Revenue Code.

(d) "Salton Sea Management Plan" means the Salton Sea Management Program Phase I: 10-Year Plan published in August 2018.

(e) "Secretary" means the Secretary of the Natural Resources Agency.

(f) "Severely disadvantaged community" has the same meaning as defined in Section 80002 of the Public Resources Code.

2951. (a) There is hereby created the Lithium Subaccount within the Salton Sea Restoration Fund.

(b) Pursuant to Section 47100 of the Revenue and Taxation Code, moneys generated by the lithium extraction excise tax imposed pursuant to Section 47010 of the Revenue and Taxation Code, and any other moneys as directed by the Legislature, are deposited into the Lithium Subaccount.

(c) Notwithstanding Section 13340 of the Government Code, the Lithium Subaccount is hereby continuously appropriated without regard to fiscal years to the agency for purposes of this article.

(d) The agency shall allocate the moneys in the Lithium Subaccount for the following purposes, except as specified in subdivision (f):

(1) Operations and maintenance of restoration projects, or other public works projects, that are in existence on January 1, 2023, or are developed by the state pursuant to the Salton Sea Management Plan or an applicable State Water Resources Control Board order, including Orders WRO 2002-0013 and WR 2017-0134 and orders issued on or after January 1, 2023.

(2) Restoration projects required to meet the state's obligations as identified in any state plan or order related to the management of the Salton Sea, including the Salton Sea Management Plan or an applicable State Water Resources Control Board order, including Orders WRO 2002-0013 and WR 2017-0134 and orders issued on or after January 1, 2023.

(3) Grants for community engagement, public amenity, capital improvement, or community-benefit projects, including projects to help build capacity for meaningful public participation and outreach, at or around the Salton Sea and those communities impacted by the Salton Sea's restoration and development, as found by the secretary to be necessary and consistent with the state management objectives in the Salton Sea Management Plan. Entities eligible for these grants include, but are not limited to, tribal governments, nonprofit corporations, and local governments that serve disadvantaged communities or severely disadvantaged communities, as found by the secretary to be necessary and consistent with the state management objectives in the Salton Sea Management Plan.

(e) When awarding a grant pursuant to paragraph (3) of subdivision (d) to a nonprofit corporation, the agency shall give preference to a nonprofit corporation that meets all of the following criteria:

(1) The nonprofit corporation is in good standing by having complied with all state and federal requirements applicable to nonprofit corporations and having not been subject to any form of sanction, suspension, or disciplinary censure.

(2) The nonprofit corporation has a demonstrated presence in the Salton Sea region and experience working across different sectors, including, but not limited to, community stakeholders, local and state agencies, academia, independent contractors, and researchers, and the nonprofit corporation's staff implementing the grant will be located in or near disadvantaged communities located near the Salton Sea.

(3) The nonprofit corporation possesses experience relating to environmental justice initiatives, health intervention programs, direct assistance services, and civic education and engagement with community stakeholders across disadvantaged communities in the Salton Sea region.

(f) Notwithstanding subdivision (d), the agency shall not allocate moneys pursuant to this article for purposes of funding an otherwise legally required mitigation project by a third party under any other existing agreement.

(g) (1) When allocating moneys pursuant to this article, the agency shall prioritize allocations immediately necessary for operations and maintenance, but may allocate those moneys for any of the purposes described in subdivision (d) based on expected revenue.

(2) Each fiscal year, the agency shall allocate a portion of the revenues deposited into the Lithium Subaccount for the purposes described in paragraph (3) of subdivision (d).

(3) The agency may maintain a prudent reserve in the Lithium Subaccount.

2952. (a) Before allocating moneys pursuant to this article, the agency shall develop and adopt project solicitation and evaluation guidelines.

(b) The guidelines may include monitoring and reporting requirements, a limit on the dollar amount of grant awards, and other requirements, including eligibility requirements.

(c) The guidelines shall encourage, where feasible, inclusion of the following project components:

(1) Efficient use of water supplies and other natural resources.

(2) Protection and preservation of habitat.

(3) Mitigation of dust or other human health hazards.

(4) Protection of tribal cultural resources.

(5) Operation and maintenance of built infrastructure.

(6) Access and inclusion of underserved or underrepresented communities in public processes.

(d) Before adopting the guidelines, the agency shall consult with tribes and hold two public meetings to consider tribal input and public comments.

(e) Before holding a public meeting related to the guidelines, the agency shall publish a draft of the guidelines on its internet website.

(f) All public meetings related to the guidelines shall be conducted in the vicinity of the Salton Sea.

(g) The secretary shall cause to be posted, in an electronic form, the adopted guidelines on the agency’s internet website.

(h) Chapter 3.5 (commencing with Section 11340) of Part 1 of Division 3 of Title 2 of the Government Code does not apply to the development and adoption of the guidelines.

2953. For purposes of implementing this article, the agency may enter into agreements with other agencies, including the Department of Water Resources.

2954. On or before June 30 of each fiscal year, the agency shall report on its internet website the projected operating and maintenance costs of state-developed or -managed public works or restoration projects at the Salton Sea for the following fiscal year that will be funded through the Lithium Subaccount.

SEC. 2. Section 15570.32 is added to the Government Code, to read:

15570.32. (a) The department, in consultation with the Department of Finance, shall prepare a study that analyzes the implementation of a gross receipts tax on the extraction of lithium, in accordance with subdivision (c), to be considered by the Legislature for future enactment as legislation.

(b) The Natural Resources Agency, the Department of Conservation, and the State Energy Resources Conservation and Development Commission shall share relevant market information and data with the department to the extent it is needed to complete the study.

(c) On or before December 31, 2023, the study, including estimated fiscal costs of administering the program, shall be submitted to the Assembly Committee on Budget and the Senate Committee on Budget and Fiscal Review.

(d) The study of replacing a volume-based tax on the extraction of lithium with an equivalent tax based on gross receipts shall include, but not be limited to, all of the following:

(1) The administrative feasibility and considerations for the department of converting a volume-based tax on the extraction of lithium to an equivalent tax based on gross receipts.

(2) The revenue stability of a tax based on gross receipts in comparison to a volume-based tax.

(3) Potential impacts on the tax burdens of in-state lithium producers.

(4) An analysis of the reliability of gross receipts data in terms of providing a meaningful measure of the value of lithium production within a particular time period, including, but not limited to, the characteristics and structure of lithium-extracting firms, types and frequency of sales by producers, price-setting mechanisms, and market volatility.

(5) Considerations on how to define gross receipts to capture the value of in-state production of lithium.

(6) An evaluation of alternatives to a volume-based tax structure that may provide protections to lithium producers if the price of lithium declines.

(e) (1) The study to be submitted pursuant to this section shall be submitted in compliance with Section 9795.

(2) Pursuant to Section 10231.5, this section is repealed on January 1, 2024.

SEC. 3. Section 2207 of the Public Resources Code, as amended by Section 20 of Chapter 521 of the Statutes of 2017, is amended to read:

2207. (a) The owner or the operator of a mining operation within the state shall forward to the supervisor annually, not later than a date established by the supervisor, on forms approved by the board from time to time, a report that identifies all of the following:

(1) The name, address, and telephone number of the person, company, or other owner of the mining operation.

(2) The name, address, and telephone number of a designated agent who resides in this state, and who will receive and accept service of all orders, notices, and processes of the lead agency, board, supervisor, or court.

(3) The location of the mining operation, its name, its mine number as issued by the Division of Mine Reclamation, its section, township, range, latitude, longitude, and approximate boundaries of the mining operation marked on a United States Geological Survey $7^1/_2$-minute or 15-minute quadrangle map.

(4) The lead agency.

(5) The approval date of the mining operation’s reclamation plan.

(6) The mining operation’s status as active, idle, reclaimed, or in the process of being reclaimed.

(7) The commodities produced by the mine and the type of mining operation.

(8) A copy of the previously completed annual inspection form and a requested date, within 12 months of the prior inspection date, for the next annual inspection by the lead agency.

(9) Proof of financial assurances.

(10) Ownership of the property, including government agencies, if applicable, by the assessor’s parcel number, and total assessed value of the mining operation.

(11) The approximate permitted size of the mining operation subject to Chapter 9 (commencing with Section 2710), in acres.

(12) The approximate total acreage of land newly disturbed by the mining operation during the previous calendar year.

(13) The approximate total of disturbed acreage reclaimed during the previous calendar year.

(14) The approximate total unreclaimed disturbed acreage remaining as of the end of the calendar year.

(15) The total production for each mineral commodity produced during the previous year.

(16) A copy of any approved reclamation plan and any amendments or conditions of approval to any existing reclamation plan approved by the lead agency.

(b) (1) Every year, not later than the date established by the supervisor, the person submitting the report pursuant to subdivision (a) shall forward to the lead agency, on forms furnished by the board, a report that provides all of the information specified in subdivision (a).

(2) The owner or operator of a mining operation shall allow access to the property to any governmental agency or the agent of any company providing financial assurance mechanisms in connection with the reclamation plan in order that the reclamation can be carried out by the entity or company, in accordance with the reclamation plan.

(c) Subsequent reports shall include only changes in the information submitted for the items described in subdivision (a), except that, instead of the approved reclamation plan, the reports shall include any reclamation plan amendments approved during the previous year. The reports shall state whether review of a reclamation plan, financial assurances, or an interim management plan is pending under subdivision (h) of Section 2770, or whether an appeal before the board or lead agency governing body is pending under subdivision (e) or (h) of Section 2770. The supervisor shall notify the person submitting the report and the owner's designated agent in writing that the report and the fee required pursuant to subdivision (d) have been received, specify the mining operation's mine number if one has not been issued by the Division of Mine Reclamation, and notify the person and agent of any deficiencies in the report within 90 days of receipt. That person or agent shall have 30 days from receipt of the notification to correct the noted deficiencies and forward the revised report to the supervisor and the lead agency. A person who fails to comply with this section, or knowingly provides incorrect or false information in reports required by this section, may be subject to an administrative penalty as provided in subdivision (c) of Section 2774.1.

(d) (1) The board shall impose, by regulation, pursuant to paragraph (2), an annual reporting fee on, and method for collecting annual fees from, each active or idle mining operation. The maximum fee for any single mining operation may not exceed ten thousand dollars ($10,000) annually and may not be less than one hundred dollars ($100) annually, as adjusted for the cost of living as measured by the California Consumer Price Index for all urban consumers, calendar year averages, using the percentage change in the previous year, except that the maximum fee for any single mining operation shall not exceed six thousand dollars ($6,000) in the 2017–18 fiscal year and eight thousand dollars ($8,000) in the 2018–19 fiscal year.

(2) (A) The board shall adopt, by regulation, a schedule of fees authorized under paragraph (1) to cover the department's cost in carrying out this section and Chapter 9 (commencing with Section 2710), as reflected in the Governor's proposed Budget, and may adopt those regulations as emergency regulations. In establishing the schedule of fees to be paid by each active and idle mining operation, the fees shall be calculated on an equitable basis reflecting the size and type of operation. The board shall also consider the total assessed value of the mining operation, the acreage disturbed by mining activities, and the acreage subject to the reclamation plan.

(B) Regulations adopted pursuant to this subdivision shall be adopted by the board in accordance with the Administrative Procedure Act (Chapter 3.5 (commencing with Section 11340) of Part 1 of Division 3 of Title 2 of the Government Code). The adoption of any emergency regulations pursuant to this subdivision shall be considered necessary to address an emergency and shall be considered by the Office of Administrative Law to be necessary for the immediate preservation of the public peace, health, safety, and general welfare.

(3) The total revenue generated by the reporting fees may not exceed, and may be less than, the amount of eight million dollars ($8,000,000), as adjusted for the cost of living as measured by the California Consumer Price Index for all urban consumers, calendar year averages, using the percentage change in the previous year, beginning with the 2017–18 fiscal year and annually thereafter. If the director determines that the revenue collected during the preceding fiscal year was greater or less than the cost to operate the program, the board shall adjust the fees to compensate for the overcollection or undercollection of revenues.

(4) (A) The reporting fees established pursuant to this subdivision shall be deposited into the Mine Reclamation Account, which is hereby created. Any fees, penalties, interest, fines, or charges collected by the supervisor or

board pursuant to this chapter or Chapter 9 (commencing with Section 2710) shall be deposited into the Mine Reclamation Account. The money in the account shall be available to the department and board, upon appropriation by the Legislature, for the purpose of carrying out this section and complying with Chapter 9 (commencing with Section 2710), which includes, but is not limited to, the classification and designation of areas with mineral resources of statewide or regional significance, reclamation plan and financial assurance review, mine inspection, and enforcement.

(B) (i) In addition to reporting fees, the board shall collect five dollars ($5) per ounce of gold and ten cents ($0.10) per ounce of silver mined within the state and shall deposit the fees collected into the Abandoned Mine Reclamation and Minerals Fund Subaccount, which is hereby created in the Mine Reclamation Account. The department may expend the moneys in the subaccount, upon appropriation by the Legislature, for only the purposes of Section 2796.5 and as authorized herein for the remediation of abandoned mines.

(ii) Notwithstanding subdivision (j) of Section 2796.5, fees collected pursuant to clause (i) may also be used to remediate features of historic abandoned mines and lands that they impact. For purposes of this section, historic abandoned mines are mines for which operations have been conducted before January 1, 1976, and include, but are not limited to, historic gold and silver mines.

(5) In case of late payment of the reporting fee, a penalty of not less than one hundred dollars ($100) or 10 percent of the amount due, whichever is greater, plus interest at the rate of $1^1/_2$ percent per month, computed from the delinquent date of the assessment until and including the date of payment, shall be assessed. New mining operations that have not submitted a report shall submit a report before commencement of operations. The new operation shall submit its fee according to the reasonable fee schedule adopted by the board, and the month that the report is received shall become that operation’s anniversary month.

(e) The lead agency, or the board when acting as the lead agency, may impose a fee on each mining operation to cover the reasonable costs incurred in implementing this chapter and Chapter 9 (commencing with Section 2710).

(f) For purposes of this section, “mining operation” means a mining operation of any kind or character whatever in this state, including, but not limited to, a mining operation that is classified as a “surface mining operation” as defined in Section 2735, unless excepted by Section 2714, and the extraction of minerals from geothermal brine, or any other brine, including, but not limited to, a mining operation colocated or co-operated with geothermal resource facilities. For purposes of fee collections only, “mining operation” may include one or more mines operated by a single operator or mining company on one or more sites, if the total annual combined mineral production for all sites is less than 100 troy ounces for precious metals, if precious metals are the primary mineral commodity produced, or less than 100,000 short tons if the primary mineral commodity produced is not precious metals.

(g) Any information in reports submitted pursuant to subdivision (a) that includes or otherwise indicates the total mineral production, reserves, or rate of depletion of any mining operation may not be disclosed to any member of the public, as defined in subdivision (b) of Section 6252 of the Government Code. Other portions of the reports are public records unless excepted by statute. Statistical bulletins based on these reports and published under Section 2205 shall be compiled to show, for the state as a whole and separately for each lead agency, the total of each mineral produced therein. In order not to disclose the production, reserves, or rate of depletion from any identifiable mining operation, no production figure shall be published or otherwise disclosed unless that figure is the aggregated production of not less than three mining operations. If the production figure for any lead agency would disclose the production, reserves, or rate of depletion of less than three mining operations or otherwise permit the reasonable inference of the production, reserves, or rate of depletion of any identifiable mining operation, that figure shall be combined with the same figure of not less than two other lead agencies without regard to the location of the lead agencies. The bulletin shall be published annually by June 30 or as soon thereafter as practicable.

(h) The approval of a form by the board pursuant to this section is not the adoption of a regulation for purposes of the Administrative Procedure Act (Chapter 3.5 (commencing with Section 11340) of Part 1 of Division 3 of Title 2 of the Government Code) and is not subject to that act.

SEC. 4. Section 2207 of the Public Resources Code, as amended by Section 366 of Chapter 615 of the Statutes of 2021, is amended to read:

2207. (a) The owner or the operator of a mining operation within the state shall forward to the supervisor annually, not later than a date established by the supervisor, on forms approved by the board from time to time,

a report that identifies all of the following:

(1) The name, address, and telephone number of the person, company, or other owner of the mining operation.

(2) The name, address, and telephone number of a designated agent who resides in this state, and who will receive and accept service of all orders, notices, and processes of the lead agency, board, supervisor, or court.

(3) The location of the mining operation, its name, its mine number as issued by the Division of Mine Reclamation, its section, township, range, latitude, longitude, and approximate boundaries of the mining operation marked on a United States Geological Survey $7^1/_2$-minute or 15-minute quadrangle map.

(4) The lead agency.

(5) The approval date of the mining operation's reclamation plan.

(6) The mining operation's status as active, idle, reclaimed, or in the process of being reclaimed.

(7) The commodities produced by the mine and the type of mining operation.

(8) A copy of the previously completed annual inspection form and a requested date, within 12 months of the prior inspection date, for the next annual inspection by the lead agency.

(9) Proof of financial assurances.

(10) Ownership of the property, including government agencies, if applicable, by the assessor's parcel number, and total assessed value of the mining operation.

(11) The approximate permitted size of the mining operation subject to Chapter 9 (commencing with Section 2710), in acres.

(12) The approximate total acreage of land newly disturbed by the mining operation during the previous calendar year.

(13) The approximate total of disturbed acreage reclaimed during the previous calendar year.

(14) The approximate total unreclaimed disturbed acreage remaining as of the end of the calendar year.

(15) The total production for each mineral commodity produced during the previous year.

(16) A copy of any approved reclamation plan and any amendments or conditions of approval to any existing reclamation plan approved by the lead agency.

(b) (1) Every year, not later than the date established by the supervisor, the person submitting the report pursuant to subdivision (a) shall forward to the lead agency, on forms furnished by the board, a report that provides all of the information specified in subdivision (a).

(2) The owner or operator of a mining operation shall allow access to the property to any governmental agency or the agent of any company providing financial assurance mechanisms in connection with the reclamation plan in order that the reclamation can be carried out by the entity or company, in accordance with the reclamation plan.

(c) Subsequent reports shall include only changes in the information submitted for the items described in subdivision (a), except that, instead of the approved reclamation plan, the reports shall include any reclamation plan amendments approved during the previous year. The reports shall state whether review of a reclamation plan, financial assurances, or an interim management plan is pending under subdivision (h) of Section 2770, or whether an appeal before the board or lead agency governing body is pending under subdivision (e) or (h) of Section 2770. The supervisor shall notify the person submitting the report and the owner's designated agent in writing that the report and the fee required pursuant to subdivision (d) have been received, specify the mining operation's mine number if one has not been issued by the Division of Mine Reclamation, and notify the person and agent of any deficiencies in the report within 90 days of receipt. That person or agent shall have 30 days from receipt of the notification to correct the noted deficiencies and forward the revised report to the supervisor and the lead agency. A person who fails to comply with this section, or knowingly provides incorrect or false information in reports required by this section, may be subject to an administrative penalty as provided in subdivision (c) of Section 2774.1.

(d) (1) The board shall impose, by regulation, pursuant to paragraph (2), an annual reporting fee on, and method for collecting annual fees from, each active or idle mining operation. The maximum fee for any single mining operation may not exceed ten thousand dollars ($10,000) annually and may not be less than one hundred dollars ($100) annually, as adjusted for the cost of living as measured by the California Consumer Price Index for all urban consumers, calendar year averages, using the percentage change in the previous year, except that the maximum fee for any single mining operation shall not exceed six thousand dollars ($6,000) in the 2017–18 fiscal year and eight thousand dollars ($8,000) in the 2018–19 fiscal year.

(2) (A) The board shall adopt, by regulation, a schedule of fees authorized under paragraph (1) to cover the department's cost in carrying out this section and Chapter 9 (commencing with Section 2710), as reflected in the Governor's proposed Budget, and may adopt those regulations as emergency regulations. In establishing the schedule of fees to be paid by each active and idle mining operation, the fees shall be calculated on an equitable basis reflecting the size and type of operation. The board shall also consider the total assessed value of the mining operation, the acreage disturbed by mining activities, and the acreage subject to the reclamation plan.

(B) Regulations adopted pursuant to this subdivision shall be adopted by the board in accordance with the Administrative Procedure Act (Chapter 3.5 (commencing with Section 11340) of Part 1 of Division 3 of Title 2 of the Government Code). The adoption of any emergency regulations pursuant to this subdivision shall be considered necessary to address an emergency and shall be considered by the Office of Administrative Law to be necessary for the immediate preservation of the public peace, health, safety, and general welfare.

(3) The total revenue generated by the reporting fees may not exceed, and may be less than, the amount of eight million dollars ($8,000,000), as adjusted for the cost of living as measured by the California Consumer Price Index for all urban consumers, calendar year averages, using the percentage change in the previous year, beginning with the 2017–18 fiscal year and annually thereafter. If the director determines that the revenue collected during the preceding fiscal year was greater or less than the cost to operate the program, the board shall adjust the fees to compensate for the overcollection or undercollection of revenues.

(4) (A) The reporting fees established pursuant to this subdivision shall be deposited into the Mine Reclamation Account, which is hereby created. Any fees, penalties, interest, fines, or charges collected by the supervisor or board pursuant to this chapter or Chapter 9 (commencing with Section 2710) shall be deposited into the Mine Reclamation Account. The money in the account shall be available to the department and board, upon appropriation by the Legislature, for the purpose of carrying out this section and complying with Chapter 9 (commencing with Section 2710), which includes, but is not limited to, the classification and designation of areas with mineral resources of statewide or regional significance, reclamation plan and financial assurance review, mine inspection, and enforcement.

(B) (i) In addition to reporting fees, the board shall collect five dollars ($5) per ounce of gold and ten cents ($0.10) per ounce of silver mined within the state and shall deposit the fees collected into the Abandoned Mine Reclamation and Minerals Fund Subaccount, which is hereby created in the Mine Reclamation Account. The department may expend the moneys in the subaccount, upon appropriation by the Legislature, for only the purposes of Section 2796.5 and as authorized herein for the remediation of abandoned mines.

(ii) Notwithstanding subdivision (j) of Section 2796.5, fees collected pursuant to clause (i) may also be used to remediate features of historic abandoned mines and lands that they impact. For purposes of this section, historic abandoned mines are mines for which operations have been conducted before January 1, 1976, and include, but are not limited to, historic gold and silver mines.

(5) In case of late payment of the reporting fee, a penalty of not less than one hundred dollars ($100) or 10 percent of the amount due, whichever is greater, plus interest at the rate of $1^1/_2$ percent per month, computed from the delinquent date of the assessment until and including the date of payment, shall be assessed. New mining operations that have not submitted a report shall submit a report before commencement of operations. The new operation shall submit its fee according to the reasonable fee schedule adopted by the board, and the month that the report is received shall become that operation's anniversary month.

(e) The lead agency, or the board when acting as the lead agency, may impose a fee on each mining operation to cover the reasonable costs incurred in implementing this chapter and Chapter 9 (commencing with Section 2710).

(f) For purposes of this section, "mining operation" means a mining operation of any kind or character whatever in this state, including, but not limited to, a mining operation that is classified as a "surface mining operation" as

defined in Section 2735, unless excepted by Section 2714, and the extraction of minerals from geothermal brine, or any other brine, including, but not limited to, a mining operation colocated or co-operated with geothermal resource facilities. For purposes of fee collections only, "mining operation" may include one or more mines operated by a single operator or mining company on one or more sites, if the total annual combined mineral production for all sites is less than 100 troy ounces for precious metals, if precious metals are the primary mineral commodity produced, or less than 100,000 short tons if the primary mineral commodity produced is not precious metals.

(g) Any information in reports submitted pursuant to subdivision (a) that includes or otherwise indicates the total mineral production, reserves, or rate of depletion of any mining operation may not be disclosed to any member of the public, as defined in Section 7920.515 of the Government Code. Other portions of the reports are public records unless excepted by statute. Statistical bulletins based on these reports and published under Section 2205 shall be compiled to show, for the state as a whole and separately for each lead agency, the total of each mineral produced therein. In order not to disclose the production, reserves, or rate of depletion from any identifiable mining operation, no production figure shall be published or otherwise disclosed unless that figure is the aggregated production of not less than three mining operations. If the production figure for any lead agency would disclose the production, reserves, or rate of depletion of less than three mining operations or otherwise permit the reasonable inference of the production, reserves, or rate of depletion of any identifiable mining operation, that figure shall be combined with the same figure of not less than two other lead agencies without regard to the location of the lead agencies. The bulletin shall be published annually by June 30 or as soon thereafter as practicable.

(h) The approval of a form by the board pursuant to this section is not the adoption of a regulation for purposes of the Administrative Procedure Act (Chapter 3.5 (commencing with Section 11340) of Part 1 of Division 3 of Title 2 of the Government Code) and is not subject to that act.

SEC. 5. Section 3823 of the Public Resources Code is amended to read:

3823. Revenues disbursed to counties of origin pursuant to Section 3821 and grants or loans made to local jurisdictions or private entities pursuant to Section 3822 shall be expended by the recipient for the following purposes:

(a) Undertaking research and development projects relating to geothermal resource assessment and exploration, and direct-use and electric generation technology.

(b) Local and regional planning and policy development and implementation necessary for compliance with programs required by local, state, or federal laws and regulations.

(c) Identification of feasible measures that will mitigate the adverse impacts of the development or production of geothermal resources, the extraction of minerals from geothermal brines, and related activities, and the adoption of ordinances, regulations, and guidelines to implement those measures.

(d) Collecting baseline data and conducting environmental monitoring.

(e) Preparation or revision of geothermal resource elements, or geothermal components of energy elements, for inclusion in the local general plan, zoning and other ordinances, and related planning and environmental documents.

(f) Administrative costs incurred by the local jurisdiction that are attributable to the development or production of geothermal resources, the extraction of minerals from geothermal brines, and related activities.

(g) Monitoring and inspecting geothermal facilities and related activities to assure compliance with applicable laws, regulations, and ordinances.

(h) Identifying, researching, and implementing feasible measures that will mitigate the adverse impacts of the development or production of geothermal resources, extraction of minerals from geothermal brines, and related activities, including mitigation measures that provide community benefits directly or indirectly related to adverse social and economic impacts.

(i) Planning, constructing, providing, operating, and maintaining those public services and facilities that are necessitated by, and result from, the development or of geothermal resources, the extraction of minerals from geothermal brines, and related activities.

(j) Undertaking projects demonstrating the technical and economic feasibility of geothermal direct heat and electrical generation applications.

(k) Undertaking projects for the enhancement, restoration, or preservation of natural resources, including, but not limited to, water development, water quality improvement, fisheries enhancement, and park and recreation facilities and areas.

(l) In furtherance of the state's zero-emission vehicle and energy storage objectives, undertaking projects to recover lithium, metals, agricultural products, and other beneficial minerals from highly mineralized geothermal brines at a geothermal facility that is in a disadvantaged community and provides local employment opportunities.

SEC. 6. Part 25 (commencing with Section 47000) is added to Division 2 of the Revenue and Taxation Code, to read:

PART 25. Lithium Extraction Tax Law

CHAPTER 1. General Provisions and Definitions

47000. (a) This part shall be known, and may be cited, as the Lithium Extraction Tax Law.

(b) The purpose of this part is to promote a robust California-based lithium extraction industry that considers the needs of the local communities where the lithium extraction occurs, while recognizing the significant benefit of having a domestic supply of lithium for the state's goals for reducing the emissions of greenhouse gases. By imposing a statewide tax on lithium extraction and preempting the taxing authority of counties, municipalities, and districts on the extraction and storage of lithium, lithium producers will have greater certainty about the potential costs of doing business and will be more likely to engage in lithium production activities.

(c) It is the intent of the Legislature to comprehensively regulate the imposition and collection of taxes on the extraction and storage of lithium and to occupy the field to the exclusion of local action, except as specifically provided in this part.

(d) The Legislature finds and declares that promoting the development of a robust lithium production industry in the state to reduce the impact of climate change is a matter of statewide concern and, therefore, is not a municipal affair as that term is used in Section 5 of Article XI of the California Constitution.

47002. For purposes of this part, the following definitions apply:

(a) "Department" means the California Department of Tax and Fee Administration.

(b) "Extraction" means the process of removing lithium from geothermal fluid, spodumene ore, rock, minerals, clay, or any other naturally occurring substance by a physical or chemical process.

(c) "Geothermal fluid" means naturally occurring groundwater, brines, vapor, and steam associated with, or derived from, a geothermal resource.

(d) "Geothermal resource" has the same meaning as defined in Section 6903 of the Public Resources Code.

(e) "In this state" means within the exterior limits of the State of California and includes all territory within these limits owned by, or ceded to, the United States.

(f) "Metric ton" means a unit of mass equal to 1,000 kilograms.

(g) "Minerals" has the same meaning as defined in Section 2005 of the Public Resources Code.

(h) "Producer" means any person who extracts lithium from geothermal fluid, spodumene ore, rock, minerals, clay, or any other naturally occurring substance in this state.

CHAPTER 2. The Lithium Extraction Excise Tax

47010. (a) Beginning January 1, 2023, a producer shall pay a lithium extraction excise tax upon each metric ton of lithium carbonate equivalent extracted from geothermal fluid, spodumene ore, rock, minerals, clay, or any other naturally occurring substance in this state, at the following amounts:

Lifetime cumulative metric tons of lithium carbonate	Applicable tax rate:

equivalent extracted by a producer:	
20,000 or less	$400 per metric ton extracted.
Over 20,000 but not over 30,000.	$600 per metric ton extracted over 20,000 up to 30,000 metric tons, inclusive.
Over 30,000 metric tons.	$800 per metric ton extracted over 30,000.

(b) (1) The tax brackets specified in subdivision (a) shall apply to the total metric tons of lithium carbonate extracted by a producer cumulatively beginning from the date the first metric ton of lithium carbonate was extracted. In each quarterly reporting period, as described in Section 47070, the producer shall add the amount of metric tons of lithium carbonate extracted during that quarter to the cumulative amount of lithium carbonate previously reported by the producer.

(2) Where the permit (ownership) of a mine, lithium extraction facility, or well changes, the cumulative amount of lithium carbonate extracted previously reported by the producer shall be assumed to be 30,000 metric tons.

(c) Beginning January 1, 2025, the lithium extraction tax rate imposed under subdivision (a) shall be adjusted annually by the department consistent with increases and decreases in the cost of living, as measured by the California Consumer Price Index issued by the Department of Industrial Relations or a successor agency, rounded to the nearest whole dollar. The first adjustment pursuant to this subdivision shall be an amount equal to the increase or decrease in the California Consumer Price Index for all urban consumers (CPI-U) from June 2023 to June 2024. Subsequent annual adjustments shall cover subsequent 12-month periods. The adjusted rate shall apply beginning the following January 1.

(d) A producer shall remit the tax to the department in a manner and form as prescribed by this part.

47015. For purposes of this part, the lithium and lithium compounds extracted shall be converted to lithium carbonate equivalent by multiplying the tonnage of lithium and lithium compounds by the appropriate conversion factor, as follows:

Lithium or lithium compound:	Conversion factor:
Lithium (Li)	5.323
Lithium oxide (Li2O)	2.473
Lithium chloride (LiCl)	0.871
Lithium bromide (LiBr)	0.425
Lithium hydroxide monohydrate (LiOH.H2O)	0.880
Butyllithium (C4HgLi)	0.576
Lithium carbonate (Li2CO3)	1.000

47020. (a) It is the intent of the Legislature that this part preempt provisions pertaining to the imposition of taxes by counties, municipalities, and districts to the extent that the provisions are inconsistent with this part.

(b) Except as provided in subdivision (c), the taxes imposed by this part are in lieu of all county, municipal, or district taxes on lithium extraction or lithium storage by producers.

(c) This section does not prohibit the application of Part 1 (commencing with Section 6001), Part 1.5 (commencing with Section 7200), or Part 1.6 (commencing with Section 7251) to the sale, storage, use, or other consumption of lithium.

CHAPTER 3. Administration

47060. The department shall administer and collect the taxes imposed by this part pursuant to the Fee Collection Procedures Law (Part 30 (commencing with Section 55001)). For purposes of this part, the references in the Fee Collection Procedures Law to "fee" shall include the taxes imposed by this part, and references to "feepayer" shall include a person required to pay the taxes imposed by this part.

47070. (a) The taxes imposed by this part shall be due and payable quarterly on or before the last day of the month following each calendar quarter.

(b) The payments shall be accompanied by a return filed by the producer using electronic media on or before the last day of the month following each quarterly period for the preceding quarterly period. Returns shall be authenticated in a form or pursuant to methods as may be prescribed by the department.

47080. (a) The department may prescribe, adopt, and enforce regulations relating to the administration and enforcement of this part, including, but not limited to, provisions governing collections, reporting, refunds, and appeals.

(b) The department may prescribe, adopt, and enforce emergency regulations relating to the administration and enforcement of this part. Any emergency regulations prescribed, adopted, or enforced pursuant to this section shall be adopted in accordance with Chapter 3.5 (commencing with Section 11340) of Part 1 of Division 3 of Title 2 of the Government Code, and, for purposes of that chapter, including Section 11349.6 of the Government Code, the adoption of these regulations is an emergency and shall be considered by the Office of Administrative Law as necessary for the immediate preservation of the public peace, health and safety, and general welfare.

47090. (a) A producer subject to this part shall register for a permit with the department using electronic media and shall set forth the name under which it transacts or intends to transact business and any other information as the department may require.

(b) By September 1 of each year, the Department of Conservation shall provide to the department the annual reports submitted pursuant to Section 2207 of the Public Resources Code that report on the extraction of lithium from geothermal fluid, spodumene ore, rock, minerals, clay, or any other naturally occurring substance by a physical or chemical process.

47100. All revenues collected pursuant to this part, less refunds and reimbursement to the department for expenses incurred in the administration and collection of the taxes imposed by this part, shall be deposited into the Lithium Extraction Excise Tax Fund, which is hereby created in the State Treasury. Notwithstanding Section 13340 of the Government Code, moneys in the fund are continuously appropriated, without regard to fiscal year, as follows:

(a) (1) Eighty percent shall be disbursed by the Controller to all counties in proportion to the amounts of the taxes, interest, penalties, and other amounts collected for lithium extraction within each county. Each county shall establish for deposit of these revenues an account or fund separate from the other accounts and funds of the county.

(2) (A) Of the amount disbursed to the County of Imperial pursuant to this subdivision, the county shall establish a method to distribute an amount not less than 30 percent of that disbursed amount to the County of Imperial communities that are most directly and indirectly impacted by the lithium extraction activities, including, but not limited to, the following communities:

(i) The directly affected communities listed below:

(I) Bombay Beach.

(II) The City of Brawley.

(III) The City of Calipatria.

(IV) Niland.

(V) The City of Westmorland.

(ii) The indirectly affected communities listed below:

(I) Bard.

(II) The City of Calexico.

(III) Desert Shores.

(IV) The City of El Centro.

(V) Heber.

(VI) The City of Holtville.

(VII) The City of Imperial.

(VIII) Ocotillo.

(IX) Palo Verde.

(X) Salton City.

(XI) Salton Sea Beach.

(XII) Seeley.

(XIII) Winterhaven.

(XIV) Vista Del Mar.

(B) The County of Imperial shall annually, on a date and in a manner determined by the department, report to the department the communities to which funding was distributed pursuant to this paragraph.

(b) Twenty percent shall be deposited into the Lithium Subaccount within the Salton Sea Restoration Fund created in Section 2951 of the Fish and Game Code.

SEC. 7. No reimbursement is required by this act pursuant to Section 6 of Article XIII B of the California Constitution because the only costs that may be incurred by a local agency or school district will be incurred because this act creates a new crime or infraction, eliminates a crime or infraction, or changes the penalty for a crime or infraction, within the meaning of Section 17556 of the Government Code, or changes the definition of a crime within the meaning of Section 6 of Article XIII B of the California Constitution.

SEC. 8. (a) The sum of five million dollars ($5,000,000) is hereby appropriated from the General Fund for allocation to the County of Imperial.

(b) The Director of Finance, or their designee, shall instruct the Controller to remit the sum set forth in subdivision (a) to the County of Imperial for deposit into the county treasury with 30 days of the Department of Finance's receipt of a letter from the county requesting the funds.

(c) The funds appropriated in this section shall be used by the County of Imperial for the following purposes:

(1) Three million eight hundred fifty thousand dollars ($3,850,000) to prepare the county's programmatic environmental impact report and a health impact assessment, and to support community outreach for geothermal energy development and lithium extraction, processing, production, and related manufacturing activities within the county.

(2) Eight hundred thousand dollars ($800,000) to distribute grants for engagement by community-based organizations in the county on the programmatic environmental impact report created by the county for lithium and geothermal energy development efforts in the county.

(3) Three hundred fifty thousand dollars ($350,000) to support the activities of an ombudsperson to engage with stakeholders on lithium extraction, rare-earth minerals mining, and renewable energy generation to provide enhanced communication by and between internal departments within the county and assistance in communication with state and federal agencies.

SEC. 9. This act is a bill providing for appropriations related to the Budget Bill within the meaning of subdivision (e) of Section 12 of Article IV of the California Constitution, has been identified as related to the budget in the Budget Bill, and shall take effect immediately.

The Salton Sea: A Status Update

MAC TAYLOR
LEGISLATIVE ANALYST
AUGUST 29, 2018

LAO

AN LAO REPORT

LEGISLATIVE ANALYST'S OFFICE

Executive Summary

The Salton Sea is California's largest inland lake, located in Riverside and Imperial Counties. In this report, we discuss the changing conditions in and around the Sea, their statewide importance, and the Legislature's role in overseeing projects to reduce potential negative effects on public health and wildlife.

The Salton Sea is Highly Saline, Gradually Shrinking. The Salton Sea was created in 1905 when a nearby irrigation canal carrying Colorado River water breached and water overflowed into the lakebed for nearly two years. In the subsequent years, agricultural runoff from farms in the Imperial Valley has fed the Sea and prevented it from fully drying up. However, over the past several decades, changes in agricultural water use practices by farmers have gradually diminished inflow into the Sea. As a consequence, the Sea has slowly been shrinking. The Sea is also highly saline—more than 50 percent saltier than the Pacific Ocean. This is partially due to the high salinity of the agricultural runoff water that is the Sea's primary source of replenishment. Additionally, because the Sea is a terminal lake with no outlet to the ocean, water that enters it can only depart through evaporation, leaving salts behind. The Sea, therefore, will continue to become increasingly saline over time.

Water Transfer Agreement Will Reduce Salton Sea Inflow. In 2003, multiple parties—including the state and three water districts in the region—entered into a series of agreements to address longstanding issues regarding usage of Colorado River water. These agreements are known collectively as the Quantification Settlement Agreement (QSA). The QSA includes an agreement to transfer water that was historically used to irrigate farm fields near the Sea to two Southern California water districts for residential uses. By reducing the amount of water available for agricultural uses in the Imperial Valley, these transfers have the effect of decreasing the amount of fresh water that runs off fields into the Sea. This, in turn, will expedite the rate at which the Sea both shrinks and becomes more saline.

Changes at the Salton Sea Pose Public Health and Environmental Risks. Absent mitigation, the reduction in inflow to the Salton Sea could lead to significant negative impacts on both public health and on wildlife. Specifically, as the Sea shrinks, an increasing amount of dry, dusty lakebed will become exposed. Some of this dust contains toxic elements that were transported through agricultural runoff, such as arsenic and selenium. Due to the high winds and arid climate around the Sea, this fine dust can become airborne, thereby increasing the amount of particulate matter in the air in the Imperial and Coachella Valleys. This is dangerous for surrounding residents—particularly children and the elderly—as over time, particulate matter can become trapped in the lungs and cause asthma attacks, bronchitis, and lung diseases. Additionally, the shrinking Sea will impair wildlife habitats. As wetland habitat has been lost to development throughout California and northern Mexico, many bird species have come to rely on the Sea for food, rest, and nesting—particularly during their annual migrations. Hundreds of thousands of birds use the Sea as a stopover point each year. As the Sea evaporates, and thereby becomes more saline, conditions will become increasingly inhospitable for the fish upon which migratory birds depend as a source of food.

Anticipating these potential effects associated with the QSA, the state required that the reductions in water flowing into the Sea be delayed to provide the state time to develop a long-term response plan. The requirement to provide those additional flows, however, expired at the end of 2017.

State Bears Primary Financial Responsibility for Responding to Changes at the Salton Sea. Through the QSA agreements and implementing statute, the state of California has assumed much of the responsibility for responding to—and mitigating against—the potential negative impacts around the Salton Sea associated with the QSA water transfers. Specifically, the three primary water agencies that were party to the QSA are responsible for spending $133 million in 2003 dollars to begin to mitigate the effects of the water transfers, and the state has committed to implementing and funding the additional activities necessary to address public health and wildlife impacts.

State Recently Developed Plan and Has Funding Available for Near-Term Management Activities . . . Despite 15 years having passed since the QSA, the state has only recently made notable progress in preparing to address the potential impacts at the Salton Sea. Specifically, in 2017, the state released a ten-year plan to guide state projects at the Salton Sea and address potential public health and environmental effects over the next decade. Some projects will provide both habitat and dust suppression benefits, while some are primarily to control dust emissions. The plan includes annual targets for acres of projects to be implemented, and the State Water Resources Control Board issued a water rights order requiring the state to meet those goals. (The order specifies that if the state fails to meet the specified acreage goals in a given year, it must "catch up" the following year, and report on how it will address the deficiency.) A total of $730 million has been authorized for Salton Sea mitigation and management activities from state, federal, and local sources, of which $507 million remained unspent as of June 2018. Of this amount, $280 million will be dedicated to begin implementing the projects in the state's ten-year management plan. It is expected that additional funding will be necessary to fully implement the state's plan.

. . . But Plans and Funding for Longer Term Management Are Still Uncertain. The state has not yet identified funding sources for the ongoing operations and maintenance of the Salton Sea projects it plans to construct over the next ten years, estimated to total between $8 million and $10 million per year at full implementation. Moreover, the state has not yet developed a plan—or cost estimates or funding sources—for how it will respond to continuing changes at the Salton Sea past 2028.

Legislature Has Important Oversight Role. After many years of inaction, activities at the Salton Sea are showing promising signs of progress. However, as the rate at which the Sea is shrinking begins to ramp up, the Legislature will want to ensure that the state remains on track to meet its obligations and avoid negative public health and environmental effects. In this report, we highlight key implementation and fiscal issues for the Legislature to monitor that will indicate whether the state is on track to manage negative impacts at the Salton Sea in the coming months and years.

INTRODUCTION

Although the Salton Sea is a lake located in an area of Southern California with a relatively sparse population, changing conditions in and around the Sea have statewide importance. This is due both to the potential for significant negative impacts to public health and the environment, as well as to the fiscal and programmatic commitments the state has made to try to prevent such impacts. Effectively responding to conditions at the Salton Sea represents a considerable and costly challenge for the state in the coming years.

This report provides a status update on conditions and activities at the Salton Sea. We describe the state's role and obligations, as well as funding and cost estimates associated with activities at the Sea. We conclude by highlighting some key issues for the Legislature to monitor in the coming years to ensure the state is effectively meeting its goals for the Salton Sea.

OVERVIEW OF THE SALTON SEA

History of the Salton Sea. The Salton Sea is California's largest inland lake, stretching about 35 miles long and up to 15 miles wide, with a water surface of approximately 360 square miles—almost twice the surface area of Lake Tahoe. As shown in **Figure 1** (see next page), the Sea is located in Riverside and Imperial Counties, in southeastern California. The Sea is a terminal lake, which means that it has no outlet to the ocean. Over the past several thousand years, the Sea has intermittently both filled and dried up in this location. This happened when, through natural processes that occurred over time, the Colorado River changed course and spilled water into the lake bed, followed by the water eventually evaporating away when the river shifted course again. The modern Sea was created in 1905 when a nearby irrigation canal carrying Colorado River water breached and water overflowed into the lake bed for nearly two years. In the subsequent years, agricultural runoff from farms in the Imperial Valley fed the Sea, preventing it from fully drying up as had occurred in the past. However, over the past several decades, changes in agricultural water use practices by nearby farmers—including increased efficiencies such as replacing sprinklers with drip irrigation—have gradually diminished inflow into the Sea. As such, the Sea has slowly been shrinking.

The land under the Salton Sea is a patchwork of ownership spread across three primary entities: the federal government (mostly the Bureau of Reclamation and the Bureau of Land Management), the Imperial Irrigation District (IID), and the Torres Martinez Desert Cahuilla Indians.

Sea Was Once a Recreational Destination. In earlier decades—particularly between the 1940s and 1960s—the Sea was a popular recreational area. Because of the warm winter climate, proximity to Southern California cities, large size, and active fishery, the Sea became a popular destination for tourism, fishing, and water sports. The California Department of Fish and Wildlife (CDFW) stocked the Sea with a variety of sport fish, and a number of communities were established around the shores of the Sea for both permanent residents and tourists. Some sources cite that at its recreational peak, the Salton Sea was drawing 1.5 million visitors annually—at the time, more than Yosemite National Park. However, due to episodes of flooding, fish die-offs, and some of the other trends described in this report, tourism over recent decades has largely faded away.

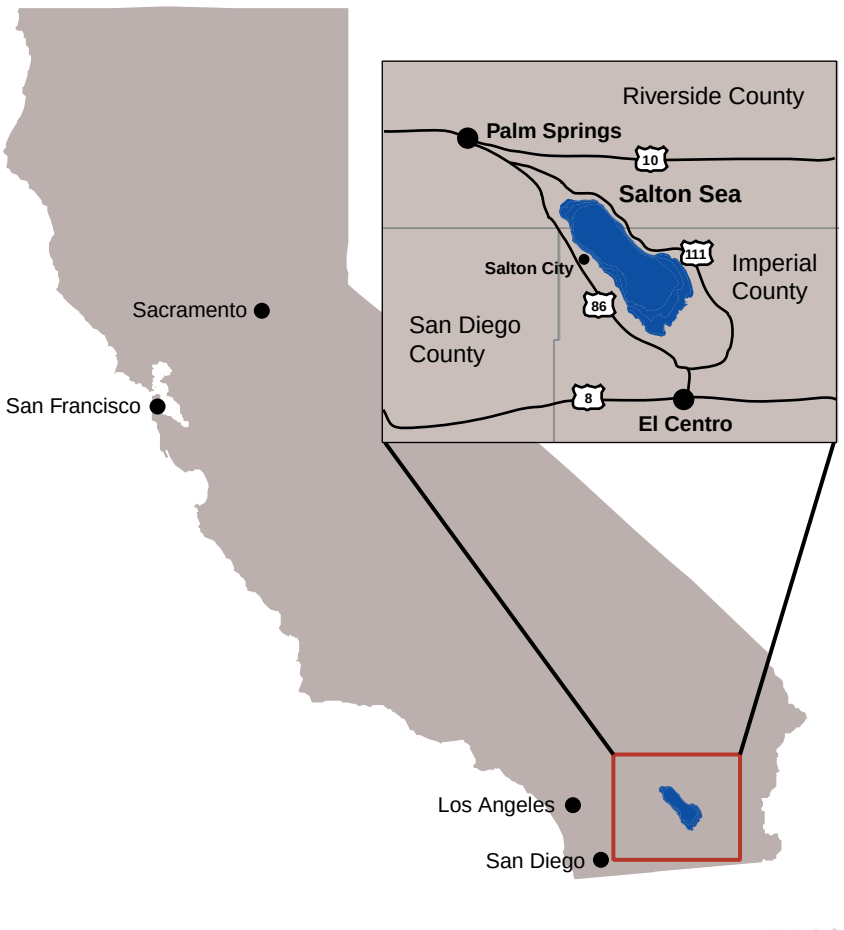
Sea Is Extremely Saline. While the modern Sea started off as a relatively fresh water body in 1905, it is now more than 50 percent saltier than the Pacific Ocean. This is partially due to the high salinity of the agricultural runoff water that has been the Sea's primary source of replenishment for the past century. Additionally, because the Sea has no outlet to the ocean, water that enters the Sea can only depart through evaporation, leaving salts behind. The Sea therefore has and will continue to

become increasingly saline over time.

Sea Provides Important Bird Habitat. Despite being a relatively new water body in geologic terms, the Sea has become an important habitat area for a large number of birds. As wetland habitat has been lost to development throughout California and northern Mexico, many bird species have come to rely on the Sea for food, rest, and nesting—particularly during their annual migrations. More than 270 species of birds use the Sea on a regular basis, including many that state and/or federal law have identified as being threatened or endangered. The Salton Sea National Wildlife Refuge—now named for Sonny Bono—was established in 1930 for waterfowl and other migratory birds. Hundreds of thousands of birds use the Sea as a stopover point on their migrations each year.

Figure 1

Map of the Salton Sea



A CHANGING SALTON SEA

2003 Colorado River Agreement Will Reduce Salton Sea Inflow. In 2003, the state, the federal government, Indian tribes, and a number of water districts in the region entered into a series of agreements to address longstanding issues regarding usage of Colorado River water. These agreements are known collectively as the Quantification Settlement Agreement (QSA). The Legislature also enacted a package of legislation to help implement the QSA. The QSA includes an agreement to transfer 300,000 acre-feet of water from IID—which uses Colorado River water to irrigate farm fields near the Sea—to two other Southern California water districts (the Coachella Valley Water District and the San Diego County Water Authority) for residential uses. (An acre foot is the amount of water that would cover an acre of land at a depth of one foot.) To accommodate the QSA transfer, IID has reduced its water use by increasing efficiencies and fallowing some fields. By reducing the amount of water available for agricultural uses in the Imperial Valley, these

transfers have the effect of decreasing the amount of water that runs off fields into the Sea. Specifically, due to both the QSA transfers and longer-term reduction trends, annual inflow to the Sea is projected to drop from 1.2 million acre-feet in 2003 to between 700,000 and 800,000 acre-feet after 2020. Therefore, while the Sea has been both shrinking in size and increasing in salinity for many decades, the decrease in inflow resulting from the QSA water transfers will expedite these trends. As we discuss later, state regulatory agencies also imposed a number of requirements to mitigate the potential effects of the QSA.

State Water Board Order Delayed Impacts of Water Transfers. Anticipating the potential effects of the QSA, the State Water Resources Control Board (SWRCB) required that the reductions in water flowing into the Sea be delayed. Specifically, the board issued a water rights order in 2002 requiring that for 15 years, IID had to continue to provide inflow water to the Sea at levels sufficient to maintain the salinity levels that would have existed absent the transfer. This was intended to provide the state time to develop a long-term plan to address the effects of the QSA transfers. The requirement to provide mitigation flows expired at the end of 2017.

Absent Mitigation, Changes Could Have Significant Negative Impacts on Both Public Health . . . As the Sea shrinks, an increasing amount of dry lake bed—referred to as "playa"—becomes exposed. In many areas, this playa is covered with fine sediments that have been deposited at the bottom of the Sea. Some of this dust contains toxic elements that were transported through agricultural runoff, such as arsenic and selenium. Due to the high winds and arid climate around the Sea, this fine dust can become airborne, thereby increasing the amount of particulate matter in the air in the Imperial and Coachella Valleys. Over time, particulate matter can become trapped in the lungs—causing asthma attacks, bronchitis, and lung diseases. Particulate matter is particularly dangerous to children and the elderly. The air quality around the Sea is already poor, due to existing airborne particulate matter from the surrounding desert, agricultural activities, and the nearby city of Mexicali, Mexico. The region consistently fails to meet federal air quality standards designed to protect public health. Unless action is taken to suppress the potential additional emissions of fine dust from newly exposed playa, the regional air quality and public health risks are likely to significantly worsen as the Sea shrinks.

. . . And on Wildlife. The shrinking Sea will also impair wildlife habitats. Specifically, as the Sea evaporates and thereby becomes more saline, conditions become increasingly inhospitable for the fish upon which migratory birds depend as a source of food. In addition to higher levels of salts, a decline in fresh water inflow will also increase the proportions and influence of other nutrients that agricultural runoff brings to the Sea (such as nitrogen and selenium), which will worsen water quality and negatively impact fish and birds. The increased proportion of such nutrients has already led to algae growth in the Sea, which has proven fatal for fish under certain conditions. For example, in a single day in August 1999, 7.6 million tilapia died from oxygen depletion due to the combined effects of heat, salinity, and algae. According to news reports from that period, the resulting blanket of dead fish along the north side of the Sea was ten miles long and three miles wide. Moreover, a retreating Sea will dry out the established vegetation and wetlands that exist along the edges of the Sea, degrading that habitat for birds as well as the fish and insects that they eat. These changes threaten the survival of the hundreds of thousands of birds that depend on the Sea as a key stop-off along the Pacific Flyway.

Additionally, desert pupfish—an endangered species under both the federal and state endangered species acts—live in creeks and drainage ditches around the Sea. While the pupfish do not live directly in the Sea, these fish are known to migrate between creeks and drainage ditches through the Sea's shoreline waters. As the shoreline recedes, these pupfish populations may become isolated from one another. This would reduce the genetic diversity of existing pupfish populations, which could make them less able to adapt to disease or other environmental stresses. It would also prevent existing pupfish populations from moving back and forth between habitat areas as

conditions change. Both of these impacts could reduce the species' long-term chance of survival.

Shrinking Sea Also Affects Local Economy. The changing Salton Sea has and will continue to have significant impacts for local residents. The Sea's increase in salinity, combined with the high levels of nutrients from agricultural runoff and resulting growth of algae, has already led to some negative effects for residents. These include repeated and sometimes significant fish die-offs, as noted above. Additionally, the algae and nutrients in the Sea often cause it to emit a distasteful sulfurous odor when temperatures are high. These types of unpleasant conditions have contributed to a significant decline in recreation and tourism over the past several decades—which has correspondingly depressed home values and limited job opportunities and economic development around the Sea. For example, census data indicate that median home prices in Salton City, the largest town along the Sea, dropped by 24 percent between 2010 and 2016 (from $113,500 to $86,600), compared to about an 11 percent drop in statewide median home prices across the same period. The unemployment rate for the region around the Sea is also significantly higher than the statewide average. The expedited pace of the Sea's retreat and increased salinity resulting from the forthcoming decline in fresh water inflow is likely to exacerbate negative conditions around the Sea and associated economic effects. Moreover, as the Sea shrinks it will increasingly leave formerly lakeside houses and boat docks stranded far from the water, further depressing their desirability, recreational utility, and resale value.

THE STATE'S ROLE AT THE SALTON SEA

Many Agencies Have a Role to Play at the Salton Sea. Numerous agencies at all levels of government are involved in responding to conditions at the Salton Sea. The principal agencies and their major roles are described in **Figure 2**. As shown, both state and local agencies are implementing activities to address the impacts of changing conditions at the Sea. Many of the local agency responsibilities result from mitigation and environmental permitting requirements associated with the QSA, which we discuss in greater detail below.

In addition to the agencies displayed in the figure, other state and federal regulatory agencies monitor the potential environmental impacts of conditions at the Salton Sea and issue permits authorizing activities. These include regional air districts, the California Air Resources Board, the Colorado Regional Water Resources Control Board, the federal Environmental Protection Agency, the federal Fish and Wildlife Service, and the United States Army Corps of Engineers. Additionally, there are numerous nongovernmental organizations that advocate for certain activities at the Salton Sea, including environmental groups, local community groups, and groups representing agricultural stakeholders.

State Bears Primary Financial Responsibility for Responding to Changes at the Salton Sea. As required by the QSA, the three QSA water agencies are responsible for spending $133 million in 2003 dollars to begin to mitigate the effects of the water transfers, and the state has committed to implementing and funding the additional activities necessary to address public health and wildlife impacts. (As discussed later, because the QSA agencies are making their expenditures over a period of many years, their total funding obligation is estimated to ultimately total around $288 million, including interest.) These commitments were codified through several pieces of legislation implementing the QSA, including Chapter 613 of 2003 (SB 654, Machado), which specified the environmental mitigation spending requirement for the QSA agencies. The legislation also stated that "any future actions to restore the Salton Sea will be the sole responsibility of the State of California." These state responsibilities are focused on responding to public health and wildlife-related impacts. While statute requires the state to *consider* local economic impacts, it does not

assign fiscal responsibility to the state to address any such impacts that may result from a shrinking Salton Sea. Addressing such concerns would fall under the jurisdiction of local governments and community organizations. (The box on the next page discusses the terms frequently used to distinguish between local and state responsibilities.)

State Has Spent Many Years Considering Options, but Few Projects Underway. Despite 15 years to plan between the QSA in 2003 and the

Figure 2

Agencies With Major Responsibilities at the Salton Sea

Entity	Role
Local	
Imperial Irrigation District (IID)	As a party to QSA, transfers up to 300,000 acre-feet per year of its water to CVWD and SDWA. Helps fund the mitigation projects required by the QSA permits and implements those projects for the QSA JPA. One of the largest landowners in the region. Delivers Colorado River water to irrigate farmland in the Imperial Valley near the Salton Sea.
Coachella Valley Water District (CVWD)	As a party to QSA, receives up to 100,000 acre-feet of additional water per year from IID. Helps fund the mitigation projects required by the QSA permits and serves as legal counsel for the QSA JPA. Delivers water for irrigation and domestic uses in the Coachella Valley near the Sea.
San Diego County Water Authority (SDWA)	As a party to QSA, receives up to 200,000 acre-feet of additional water per year from IID. Helps fund the mitigation projects required by the QSA permits and handles administration and finance for the QSA JPA.
QSA JPA	JPA including IID, CVWD, SDWA, and the state Department of Fish and Wildlife. Administers funding for implementing the mitigation activities required by QSA permits.
Salton Sea Authority	JPA including IID, CVWD, the Torres-Martinez tribe, and Imperial and Riverside counties. Partners with other entities to develop projects to restore the Sea.
State	
Natural Resources Agency	Serves as lead agency overseeing and guiding state's Salton Sea activities. Coordinates and negotiates with other local, state and federal agencies.
Department of Water Resources	Implements most of state's restoration projects at the Sea, including engineering and design, contracting, construction, and operations and maintenance.
State Water Resources Control Board	Responsible for protecting water quality and water rights, including by: issuing permit for QSA water transfers, imposing certain permit conditions (such as provision of mitigation water for 15 years), and requiring that the state construct specified amounts of projects at the Sea each year.
Department of Fish and Wildlife	Helps design Salton Sea habitat projects, will develop and implement wildlife monitoring program for constructed habitat. Issues regulatory permits for projects at the Sea as required by state law. Administers Salton Sea Restoration Fund.
Tribal	
Torres-Martinez Band of Desert Cahuilla Indians	Largest private landowner of property around the Sea, including roughly half of the land under the Sea. Partners with other agencies on restoration projects, including pilot wetland project on tribal land at north end of Sea.
Federal	
Bureau of Reclamation	Owns significant amount of land under and around the Sea.

QSA = Quantification Settlement Agreement and JPA = Joint Powers Authority.

end of the temporary inflow to the Sea in December 2017, the state has not yet implemented any major management projects at the Salton Sea. In 2007, the California Natural Resources Agency (CNRA) released a study of eight potential approaches to restoring the Sea, and recommended a "preferred alternative" to the Legislature with a corresponding cost of $9 billion. Funding constraints—including those associated with the severe recession that followed—rendered this plan infeasible. In the subsequent years, the state has given out some grants for partner agencies to implement small pilot projects at the Sea, but state activities have primarily been focused on studying options and conducting reviews of potential environmental impacts. In 2014, frustration with the slow pace of management activities led IID to petition SWRCB to amend its original QSA-related water rights permit and require the state to begin implementing a management plan, leading to corresponding SWRCB action in 2017. **Figure 3** displays these and other significant events at the Salton Sea. As shown in the figure, the state only recently adopted—and began funding—a plan for making significant progress on management activities. We describe this plan in the next section.

Defining Mitigation, Management, and Restoration Projects

As discussed throughout this report, a number of different agencies at both the local and state levels are undertaking projects in response to the changes occurring at the Salton Sea. While many of these projects have similar goals, statute and stakeholders often distinguish between them—and how they are funded—using different terms. Such terms include:

- ***Mitigation Projects.*** Salton Sea *mitigation* projects are often referred to as those undertaken by the three water agencies that were party to the Quantification Settlement Agreement (QSA) in response to QSA-related environmental permitting requirements. As a condition of approving the QSA water transfers, state and federal regulatory agencies conducted environmental reviews and required that the participating water agencies—the Imperial Irrigation District, Coachella Valley Water District, and San Diego County Water Authority—implement specific actions to mitigate the resulting impacts. These included providing additional inflow water to the Sea until December 2017, developing marsh habitat areas, and implementing a defined air quality monitoring and dust mitigation program. The agencies' responsibilities for funding these mitigation activities, however, are capped at $133 million (in 2003 dollars).
- ***Restoration or Management Projects.*** Stakeholders commonly refer to the additional actions necessary to address the impacts of a shrinking Sea after the QSA parties have fulfilled their required mitigation expenditure levels as either *restoration* or *management* projects. The state agreed to assume the remaining financial responsibility for addressing these potential impacts.

This semantic distinction between the locally funded and state-funded activities, however, is somewhat misleading. The state does not plan to "restore" the Sea to its original conditions, and its planned activities to decrease the potential harmful effects of the water transfers are somewhat similar to those being undertaken by the QSA agencies. As such, all of these activities could accurately be described as mitigation. Yet because statute and many stakeholders use different labels to distinguish between local and state efforts, to avoid confusion we refer to state-funded activities as "management projects" throughout this report.

Figure 3

Timeline of Significant Events at the Salton Sea

1905
Modern Salton Sea formed by floodwaters from breach in Colorado River canal; breach repaired nearly two years later.

1930
Salton Sea Wildlife Refuge established for protection of ducks, geese, and shore birds.

1950
Due to increasing recreational activity, salt water game fish introduced to the Sea.

1999
Due to deteriorating conditions at the Sea, 7.6 million fish die in one day from oxygen depletion resulting from combination of heat, salinity, and algae.

2003
Quantification Settlement Agreement (QSA) signed and companion legislation enacted. Required transfer of water from Imperial Irrigation District to San Diego County Water Authority and Coachella Valley Water District, established a fixed amount of funding for Salton Sea mitigation projects, and designated additional management activities as state responsibility.

2007
Restoration plan developed by California Secretary for Natural Resources with $8.9 billion "preferred alternative" approach; no legislative action taken.

2014
Petition submitted by Imperial Irrigation District to State Water Resources Control Board to modify QSA-related water rights permit in order to "hold the [state] to its obligation to restore the Salton Sea." Proposition 1 passed by California voters, authorizing $80 million for Salton Sea management activities.

2015
Salton Sea Task Force established by Governor to identify short- and medium-term goals for responding to conditions at the Sea.

2017
State's Salton Sea Management Program established and associated *Phase I Ten-Year Plan* released. Stipulated order adopted by State Water Resources Control Board, requiring implementation of state's management plan and annual construction goals. Fifteen-year requirement to provide mitigation water inflows to the Sea ends.

2018
Proposition 68 passed by California voters, authorizing $200 million for Salton Sea management activities.

TEN-YEAR MANAGEMENT PLAN

State Recently Developed Ten-Year Management Plan. In 2017, the state established the Salton Sea Management Program—led by CNRA in collaboration with the Department of Water Resources (DWR) and CDFW—and published the *Phase I Ten-Year Plan* (the Plan) to guide state projects at the Salton Sea and address potential public health and environmental effects over the next decade. Figure 4 displays the planned areas of focus for state activities, as well as how the

Figure 4

Salton Sea Management Program Overview 2018-2028

footprint of the Salton Sea is expected to shrink over the coming decade. The Plan focuses on activities at the north and south ends of the Sea where the greatest playa exposure is expected and where water from agricultural return flows is more readily available to incorporate into management projects.

Figure 5 shows estimates for the acreage of dry lake bed to be exposed in the coming years, alongside the Plan's acreage goals for projects. The actual playa exposure rates each year are likely to vary from these estimates based on factors such as heat, rainfall, and agricultural runoff. As shown, the state does not plan to undertake projects on every acre of playa as it is exposed. For example, between 2018 and the end of 2020, the state plans to construct projects on 3,500 acres, even though it estimates that 12,700 acres of playa will have become exposed during that period. This is because some of the exposed areas around the Sea may not be emissive—that is, the soil conditions may be such that dust is not likely to become airborne—or the land may be used for other purposes such as agriculture or geothermal energy. Additionally, the Plan states that a lag time of up to two years exists between when playa is exposed and when it may become emissive, allowing additional time for project implementation. The state's construction schedule reflects this additional time, with plans to undertake projects on about one-quarter of newly exposed playa in the first three years, growing to about 60 percent of cumulative exposed playa by the end of the ten-year period.

Figure 5

Estimated Salton Sea Playa Exposure and Management Goals Over the Next Decade

From Salton Sea Management Program Phase I Ten-Year Plan

Year	Acres of Newly Exposed Playa	Acres of Projects To Be Constructed
2018	3,500	500
2019	4,200	1,300
2020	5,000	1,700
2021	5,600	3,500
2022	5,500	1,750
2023	5,300	2,750
2024	4,900	2,700
2025	4,300	3,400
2026	3,900	4,000
2027	3,300	4,000
2028	2,800	4,200
Totals	**48,300**	**29,800**

Projects Would Provide Both Habitat and Dust Suppression. Figure 6 provides examples of the types of projects identified in the Plan. As described in the figure, some projects provide both

Figure 6

Key Types of Salton Sea Management Projects

✓ ***Various Types of Habitat.*** Habitats near the Salton Sea—including along the exposed shoreline—can be designed and constructed to serve the needs of a variety of species. These include wetland, riparian, shallow-water mudflat, and mid- to deep-water habitats. Project activities will include providing a permanent source of fresh or brackish water, constructing islands for nesting grounds, and constructing berms to hold water in ponds. Most of these types of habitat projects also provide dust suppression.

✓ ***Dust Suppression.*** A variety of projects can be implemented to minimize the amount of dust emitted from the playa. In addition to the habitat projects described above, other water-dependent dust suppression techniques include planting vegetation, applying water to help form a salt crust across the ground surface, and periodic flooding to keep the ground from drying out too much. Waterless techniques include tilling or roughening the ground surface, and applying a gravel cover.

✓ ***Water Delivery Infrastructure.*** Water management ponds and a distribution system can be constructed to bring less salty water to habitat projects. Ponds along the edges of the lakeshore will blend Salton Sea water and agricultural return flow water, creating brackish water with a lower level of salinity. A distribution system—including outlets, pumps, channels, and pipelines—will bring agricultural return flow water from nearby rivers to water management ponds and habitat and dust suppression project areas.

habitat and dust suppression benefits, while some are primarily to control dust emissions. The state may opt to implement projects primarily designed for dust suppression in areas not well-suited for habitat, and/or because in many cases they are easier and less costly to implement than habitat projects (which generally require provision of water). A key activity for developing functional habitats is to create ponds containing water with salinity levels that migrating birds—and the fish and insects upon which they feed—can tolerate. Construction is currently underway on two pilot habitat projects—Red Hill Bay and Torres Martinez Wetlands, both shown in Figure 4.

Plan's Annual Management Goals Formalized Through SWRCB Order. In response to the 2014 petition from IID, SWRCB approved a stipulated water rights order in November 2017 that revised the conditions of the permit approval that SWRCB granted for the QSA. Specifically, the order requires the state to meet the annual acreage goals included in the Plan and displayed in Figure 5. The order also requires that for each year, at least half of the project acres that the state constructs must provide habitat benefits for fish and wildlife; that is, no more than half of annual construction can be solely focused on dust suppression. Every year, SWRCB will hold a public meeting by March 31 to hear a progress report on the previous year, including updates on completed projects and the amount of acreage, as well as plans for the coming year and funding availability. The order specifies that if the state fails to meet the specified acreage goals in a given year, it must "catch up" the following year, and report to SWRCB on how it will address the deficiency.

In addition to the SWRCB order, implementation of the Plan is supported by an agreement with the federal government. Specifically, CNRA entered into a Memorandum of Understanding (MOU) with the federal Department of the Interior affirming that the state has the lead role in Salton Sea management efforts, and expressing mutual intent to try to support achievement of the goals in the Plan (such as by expediting permitting processes).

Specific Project Activities to Be Determined Over Coming Years. The Plan does not contain a detailed list and timeline for specific projects that will be undertaken across the full ten year period. Instead, it lays out a high-level schedule for target project locations and establishes the acreage goals described in Figure 5. CNRA and DWR have indicated they intend to develop a more detailed implementation plan as conditions—such as funding availability, Sea salinity levels, environmental permits, playa exposure, and land-use agreements with landowners—develop over the coming years. Additionally, the Plan states that future activities will be informed by lessons learned from projects that are currently underway. In initial years, the Plan states that work will focus on expanding the Species Conservation Habitat (SCH) project, shown in Figure 4 in the southwest region of the Sea. This project, on which construction is scheduled to begin by the end of 2018, will provide two ponds of brackish water for fish and bird habitat and dust suppression. The state has spent millions of dollars and many years planning for this project, and funding for initial construction has already been appropriated by the Legislature. According to the Plan, the SCH project will be expanded with additional ponds, address newly exposed playa, and help meet the Plan's acreage goals for the next few years. The Plan states that such work could progress relatively quickly because environmental reviews and permitting have already been completed.

Progress on Achieving Plan's Goals Already Delayed. As shown in Figure 5, the state planned—and the SWRCB stipulated order required—construction of 500 acres of new projects by the end of 2018. The state envisioned meeting this goal by constructing the second, expanded stage of the SCH project. However, delays in negotiating land-use agreements from IID—which owns the land where the project will be constructed—mean that the first stage of that project likely will not begin until near the end of 2018. As such, the state will not even select a contractor for the second stage until 2019, and thus will fail to meet the SWRCB stipulated order goals. CNRA and DWR are in the process of revising their annual management targets accordingly and indicate that they plan to construct additional acres at the SCH project in the coming years in order to catch up to the cumulative requirement of 3,500 acres by the end of 2020.

Long-Term Management Plans Not Yet Developed. The state has not yet developed a plan for how it will respond to changes at the Salton Sea past 2028. Estimates suggest that the Sea will continue to shrink until around 2045, at which point it will become so salty that it will stop evaporating. The SWRCB stipulated order requires that CNRA develop subsequent ten-year management plans based on updated information midway through each current planning phase; as such, by 2022 it must develop a Phase 2 plan to address changes through at the Sea through 2038. The order also directs CNRA to develop a long-term management plan by the end of 2022. The state has created a committee to begin developing these plans. In addition to the types of projects described in Figure 6, potential future projects under consideration include carving off the north part of the Sea to create a separate, more sustainable lake. (The Riverside County Board of Supervisors is considering creating an enhanced infrastructure finance district to help fund this "North Lake" proposal.) Additionally, CNRA solicited proposals for how the state might import water to the Salton Sea, and is considering the feasibility of incorporating ideas from the 11 responses it received into a long-term management strategy.

FUNDING AND COSTS FOR SALTON SEA MANAGEMENT ACTIVITIES

Over $700 Million Has Been Authorized for Management Activities. As shown in Figure 7 (see next page), a total of $730 million has been authorized for Salton Sea mitigation and management activities from state, federal, and local sources. This total represents funding that has been set aside or committed specifically for activities at the Salton Sea by voters, the Legislature, the federal government, and local water agencies. As shown, the bulk of this funding has come from voter-approved state general obligation bonds. Of the state funding that has been expended thus far, most has been used for planning activities including permitting and environmental reviews.

Local Funding Provided by Three Water Agencies Associated With QSA. The local funding displayed in the figure is shown in two categories, both of which represent required contributions from the three QSA water agencies. As noted earlier, the QSA included an agreement that IID, the Coachella Valley Water District, and the San Diego County Water Authority provide $133 million in 2003 dollars to mitigate for the effects of the water transfers. This funding, which is estimated to total $288 million over time including interest, is managed by the QSA Joint Powers Authority. The bulk of those expenditures thus far has been to provide mitigation water into the Sea through 2017. Additionally, the QSA agreements required that the three agencies provide $30 million in 2003 dollars into the "Salton Sea Restoration Fund" to be used for state-led restoration activities. This funding, which is estimated to total $68.5 million over time including interest, is administered by CDFW.

Significant Funding Remains Unspent. As shown in Figure 7, more than two-thirds ($507.5 million) of the total amount authorized remains unspent, largely because a significant amount ($280 million) was only recently approved by voters through Proposition 1 in November 2014 and Proposition 68 in June 2018. Additionally, the multiyear payment schedule established for the required QSA mitigation payments means that nearly half of the required funding from the QSA Joint Powers Authority ($130.5 million) has not yet been provided or expended. The QSA Joint Powers Authority estimates that two of its member agencies will make their final mitigation payments in 2025, and the third will do so in 2036.

State Estimates Implementing Ten-Year Management Plan Will Cost $420 Million. As shown in Figure 8 (see next page), the state estimates it will face costs of $420 million to implement the goals included in the *Phase I Ten-Year Plan* and required by the SWRCB order. These costs reflect updated estimates from

Figure 7

Funding for Salton Sea Mitigation and Management

As of June 2018 (In Millions)

Source	Authorized	Unspent	Use
State			
Proposition 12 (2000)	$4.8	$4.8	Constructing Species Conservation Habitat (SCH) project.
Proposition 50 (2002)	33.6[a]	9.7	Environmental Impact Report and related studies and planning activities, SCH project.
Proposition 84 (2006)	47.0	23.4	Staffing and planning activities; SCH project planning and design; partial funding for projects including Red Hill Bay, Seawater Marine Habitat Pilot, and Torres-Martinez Wetlands.
Proposition 1 (2014)	80.0	77.3	Projects to meet goals identified in Phase I Ten-Year Plan.
Proposition 68 (2018)	200.0	200.0	Projects to meet goals identified in Phase I Ten-Year Plan.
Federal			
NRCS (to Salton Sea Authority)	$7.5	$7.5	Agricultural dust suppression and wetlands projects.
NRCS (to state)	0.8	0.8	Planning activities.
Local			
QSA Joint Powers Authority	$288.0	$130.5	Various mitigation requirements associated with the QSA.
Salton Sea Restoration Fund	68.5	53.5	Various restoration activities.
Totals	**$730.1**	**$507.5**	

[a] The bond authorized $58.6 million for various purposes in the Colorado River basin, of which $33.6 million has been allocated specifically for activities at the Salton Sea.

NRCS = National Resources Conservation Service and QSA = Quantification Settlement Agreement.

DWR as of August 2018, including addressing the SWRCB requirement that half of the acres completed each year provide a habitat benefit (which was not reflected in the original Plan). As shown, these estimates do not break out costs by year but rather by multiyear construction stages, and reflect an updated plan to construct slightly more (600 acres) than was included in the original Plan and SWRCB requirement.

As of the writing of this report, $280 million is available from Propositions 1 and 68 to support the $420 million in estimated costs. To date, the Legislature has appropriated $110 million of this funding—$80 million from Proposition 1 in the *2016-17 Budget Act* and $30 million from Proposition 68 in the *2018-19 Budget Act*. Since project construction has not yet commenced, only a small amount has been expended for staff and planning costs thus far. The state has not identified a funding source to support the remaining $140 million in Plan implementation

Figure 8

Estimated Costs for Implementation of Salton Sea Management Program Phase I Ten-Year Plan

From the Department of Water Resources, August 2018

Period	Projects Constructed (in Acres)	Costs (in Millions)
2018-2019	2,068	$3
2020-2022	11,318	206
2023-2026	8,253	107
2027-2028	8,776	104
Totals	**30,415**	**$420**

costs—the difference between the $420 million cost estimate and the $280 million in bond funds authorized. However, Proposition 3 on the November 2018 ballot would provide an additional $200 million in bond funds for Salton Sea management activities if it is approved by voters.

Future Costs and Funding Sources Yet to Be Identified. The state also has not yet determined how it will fund either ongoing operations and maintenance costs or future management activities beyond 2028. DWR estimates that ongoing operations and maintenance costs will likely total between $8 million and $10 million annually once all of the Phase I projects are complete. These ongoing costs would be for activities such as energy for pumping water to habitat ponds, staff time to monitor project conditions and effectiveness, addressing erosion of or damage to earthen berms, and replacing damaged or worn-out equipment. In the MOU between CNRA and the federal Department of the Interior, the federal government committed to pursuing $30 million in federal funds to help with the state's operations, maintenance, and monitoring costs. However, no such congressional appropriation has yet been made. Additionally, cost estimates and funding sources for addressing impacts at the Sea as it continues to shrink beyond the next ten years still are unknown because long-term management plans have not yet been developed.

KEY ISSUES FOR LEGISLATIVE OVERSIGHT

Legislature Has Important Oversight Role. After many years of inaction, activities at the Salton Sea are showing promising signs of progress. However, as the rate at which the Sea is shrinking begins to ramp up, the Legislature will want to ensure that the state remains on track to meet its obligations and avoid negative public health and environmental effects. The Legislature has several opportunities for exercising its oversight role, monitoring progress at the Salton Sea, and determining whether legislative intervention might be needed. These include legislative oversight hearings, consideration of future funding requests through the annual budget process, and reviews of CNRA's required annual progress reports to SWRCB. If delays continue or other concerns arise, the Legislature could also request to receive intermittent or regular status updates directly from the administration. Below, we describe key issues for the Legislature to monitor in the coming months and years that will indicate whether the state is on track to manage negative impacts at the Salton Sea.

Short-Term Management. While the state's Phase I Plan lays out goals and high-level descriptions of potential projects, it does not contain a detailed description or timeline for exactly which projects will be undertaken. The Legislature will want to track implementation of the Plan to ensure not only that the state is meeting its annual construction goals, but—more importantly—that it is achieving its larger objectives of avoiding negative health and environmental impacts over the coming decade. Specific questions for the Legislature to monitor in the coming months and years include:

- Is the state consistently achieving its annual acreage construction goals? If not, what are its remediation plans?
- Are there specific barriers that are impeding the state's progress, and are there legislative actions that could help to address those challenges?
- Does the state have sufficient staffing and project management structures in place to achieve its goals?
- What criteria is the state utilizing to select the types and locations of projects to undertake each year?
- What monitoring processes is the state putting in place, and what indicators will it use to ensure it is effectively meeting its objectives? How will the state ensure that its efforts are successful in avoiding negative public health and environmental impacts?

- What adaptive management practices is the state putting into place to modify its approach and respond to new information or changing conditions? How will the state learn from the successes and challenges it has faced in its management efforts and ensure those lessons are incorporated into subsequent plans, projects, and activities?

Long-Term Management. Although the state has made significant progress over the past two years in its short-term planning efforts, it still lacks a plan for how it will manage changes at the Salton Sea that will occur after 2028. The Legislature will want to ensure that the state does not delay such planning efforts to the point where it faces risks to public health and the environment that could have been avoided. This is of particular concern given the state's track record of slow progress between 2003 and 2017 in planning for impending changes at the Sea. Key oversight questions include:

- Is the state making adequate progress on developing a long-term plan for the continually shrinking Sea?
- How are long-term planning efforts accounting for potential new developments and the possible impacts of climate change at the Sea, such as additional inflow reductions from reduced Colorado River allocations, droughts, and hotter temperatures?
- Are there ways to ensure effective participation of relevant parties in the region—such as the federal government and local stakeholders—in long-term planning?

Funding and Costs. As noted earlier, how the state will fund future activities at the Salton Sea is still uncertain. Of particular concern is the lack of identified funding for ongoing operations and maintenance for the management projects the state plans to construct in the coming ten years. Questions for the Legislature to monitor over the coming months and years include:

- Have cost estimates for implementing the Phase I Management Plan changed?
- What are the estimated costs for long-term management activities at the Salton Sea?
- How will the state fund (1) remaining costs to implement the Ten-Year Plan; (2) ongoing operations, maintenance, and monitoring activities; and (3) long-term management activities?
- Are there other funding sources (such as federal funds) that could be attained to help supplement state funding?

LAO PUBLICATIONS

This report was prepared by Rachel Ehlers and reviewed by Brian Brown. The Legislative Analyst's Office (LAO) is a nonpartisan office that provides fiscal and policy information and advice to the Legislature.

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Ready for Work

Now Is the Time for Heavy-Duty Electric Vehicles

HIGHLIGHTS

Electric trucks and buses represent the next frontier for electric vehicles. Increasingly available, they have zero tailpipe emissions and lower life cycle global warming emissions compared with other types of trucks or buses. Widespread electrification already makes sense for several classes of heavy-duty vehicles based on their operating characteristics, the range of today's battery technologies, and similar if not cheaper ownership costs. While internal combustion engines have been in use for more than a century, three types of policies can accelerate the electrification of trucks and buses: financial incentives, investments in charging infrastructure, and standards that increase the manufacture and purchase of heavy-duty electric vehicles. All of these policies should center on improving air quality in communities most burdened by vehicle pollution.

Light-duty electric vehicles in the United States hit a major milestone at the end of 2018: total sales-to-date passed the 1 million mark (Auto Alliance n.d.). While significant uptake of electric passenger vehicles is still needed to reduce the climate and air quality impacts of the light-duty vehicle sector, signals in policy, technology, and the market suggest that widespread electrification of cars, SUVs, and light pickup trucks is possible.

What about electrifying the other vehicles on the road, heavy-duty vehicles? While further from reaching 1 million sales, trucks and buses are undoubtedly the next frontier for widespread electrification of vehicles.

Today's heavy-duty vehicles, fueled predominately with diesel, have a big impact on air quality, public health, and the climate. But electric trucks and buses have zero tailpipe emissions, and, powered by today's electricity grid, produce fewer global warming emissions than their combustion counterparts. Increasing availability and decreasing costs point to a bright future for heavy-duty electric vehicles. Policy support will be critical, however, to transition from the ubiquity of internal combustion engines.

Jimmy O'Dea/UCS

Semi trucks that transport cargo containers to and from ports and railyards ("drayage trucks") often travel short distances per trip and are well-suited for electrification. Several electric models, with ranges up to 300 miles, are already in demonstration today.

Union of Concerned Scientists

Why Trucks and Buses?

Nationally, the transportation sector represents the largest source of global warming emissions—29 percent of all emissions (EPA 2019).[1] It is also a major source of air pollution in the United States. Within the transportation sector, heavy-duty vehicles disproportionately contribute to emissions.

Despite comprising just 10 percent of vehicles on US roads, heavy-duty vehicles contribute 28 percent of global warming emissions from the nation's on-road transportation sector (EIA 2016; FHWA 2016; EPA 2019) (see Box 1).[2] They are also responsible for 45 percent of on-road NO_x emissions (oxides of nitrogen) (see Figure 1) and 57 percent of on-road, direct $PM_{2.5}$ emissions (particulate matter less than 2.5 micrometers in diameter) (EPA 2018a).[3] NO_x—a precursor to smog and $PM_{2.5}$—and particulate matter are major sources of air pollution, and they pose significant health risks at all stages of life, from premature births to premature deaths (Caiazzo et al. 2013; Darrow et al. 2009). Heart attacks, cancer, reduced lung function, and exacerbation of asthma are the health effects most frequently associated with air pollution from vehicles, but researchers have reported negative health outcomes for many other parts of the body as well (ALA 2019).

On-road sources of air pollution disproportionately burden communities of color and low-income communities due to their proximity to roads and vehicular traffic. Asian Americans, African Americans, and Latinos are exposed to 34 percent, 24 percent, and 23 percent more $PM_{2.5}$ pollution (respectively) from cars, trucks, and buses than the national average (Reichmuth 2019a; Reichmuth 2019b).

The disproportionate contribution of heavy-duty vehicles to global warming emissions results from both the large amount of fuel consumed per mile and the high mileage they travel compared with light-duty vehicles. In 2017, diesel transit buses averaged 4.0 miles per gallon (mpg); tractor (semi) trucks, 6.0 mpg; and single-unit trucks (i.e., non-semi trucks), 7.4 mpg; while cars averaged 24.2 mpg (FHWA 2019; FTA 2018). Additionally, the average semi truck travels more than 60,000 miles per year (with newer trucks traveling close to 90,000 miles per year), compared with less than 12,000 miles for the average passenger car (FHWA 2019; Komanduri 2019).

The prevalence of diesel engines in heavy-duty vehicles also contributes to their large share of NO_x and $PM_{2.5}$ emissions compared with light-duty vehicles, which predominantly use gasoline engines (see Box 2, p. 4). More than 50 percent of

> ***Despite comprising just 10 percent of vehicles on US roads, heavy-duty vehicles contribute 45 percent of NO_x emissions from the nation's on-road transportation sector.***

BOX 1.

What Is a Heavy-Duty Vehicle? 2b or Not 2b?

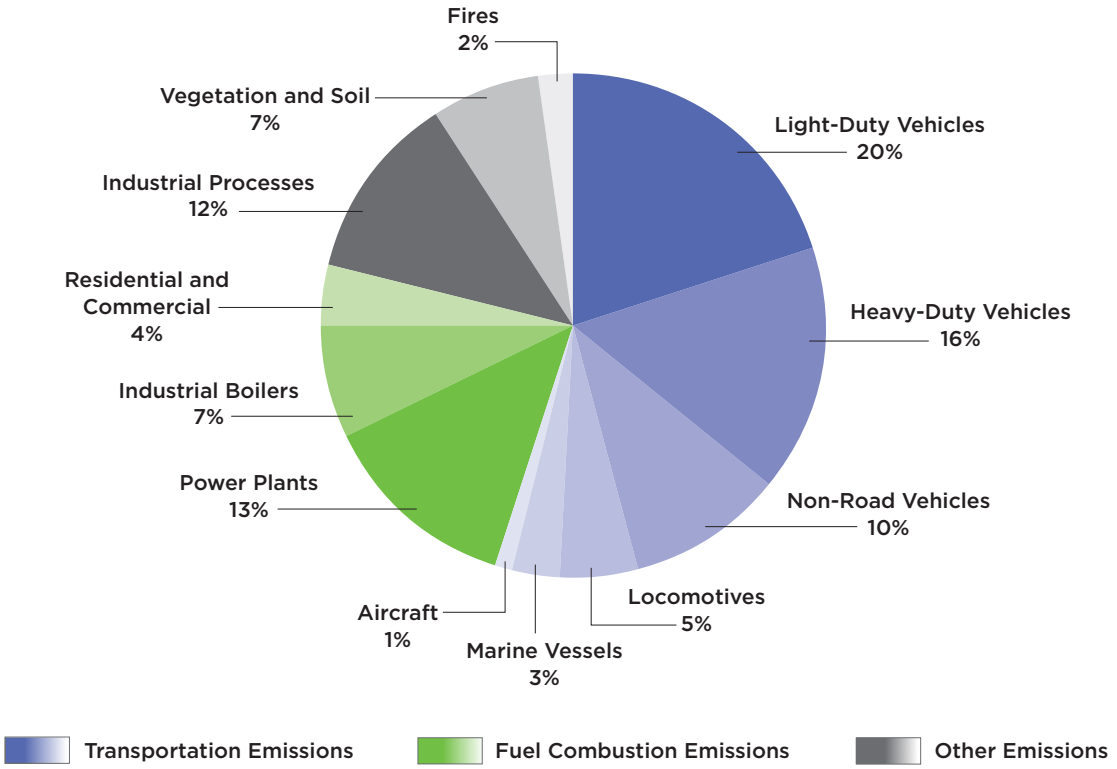
Ask three people, three databases, or three government agencies to define a heavy-duty vehicle and you will get three different answers (AFDC n.d.). Vehicles are categorized into "classes" based on their gross vehicle weight rating (GVWR), ranging from Class 1 (cars and most SUVs) to Class 8 (semi trucks and transit buses). GVWR is the maximum weight at which a fully loaded vehicle is rated to operate, including cargo, passengers, etc.

Definitions of heavy-duty vehicles vary on which classes they include, especially whether or not they include Class 2b vehicles (GWVR of 8,501 to 10,000 pounds). Given the large number of Class 2b vehicles compared with other heavy-duty vehicles (roughly 50 percent or more of all Class 2b–8 vehicles), it is important to recognize whether data include this class or not (Birky et al. 2017). Heavy-duty vehicle statistics cited in this report include Class 2b vehicles.

Vehicles in the Class 2b category cover a range of commercial and personal applications, including cargo vans (e.g., Mercedes-Benz Sprinter) and pickup trucks (e.g., Ford F-250). Unlike Class 3–8 vehicles, roughly three-quarters of which use diesel, Class 2b vehicles more commonly have gasoline engines than diesel (roughly two-thirds are gasoline) (CARB 2018a; Davis et al. 2017; Birky et al. 2017). In light-duty vehicles, diesel comprises less than 1 percent of the population (EIA 2019b).

Note, GVWR is different than a vehicle's "curb weight"—the weight of the vehicle without a load—and "gross vehicle weight"—the actual weight of the vehicle and load during operation (40 US Code). In general, a person must have a commercial driver's license to operate a vehicle with GVWR over 26,000 pounds or for transporting hazardous materials or 15 or more passengers (FMCSA 2017). GVWR also does not include the weight of a trailer. For that, there is "gross vehicle *combined* rating."

FIGURE 1. National Emissions of Nitrogen Oxides, by Sector



In the United States, heavy-duty vehicles are the second largest source of nitrogen oxides, a major air pollutant.

SOURCE: EPA 2018A.

Jimmy O'Dea/UCS

Delivery trucks are ideal candidates for electrification, given their local routes and operating ranges. Most delivery trucks travel less than 100 miles per day, well within the range of electric models on the market today.

BOX 2.

Why Diesel Engines Emit More Pollutants

A gasoline engine compresses a mixture of fuel and air and ignites it with the help of a spark. A diesel engine compresses air to higher pressures, increasing its temperature enough to ignite the diesel when it subsequently enters the engine's cylinder. The long crankshaft used to compress air in a diesel engine produces a higher torque than gasoline engines, which makes diesel the preferred fuel over gasoline for vehicles carrying heavy loads. However, the higher operating temperature of diesel engines favors the formation of NO_x compared with gasoline engines. Higher emissions of particulate matter from diesel engines result from higher levels of incomplete fuel combustion. The same advantages that diesel offers over gasoline—higher torque and better efficiency—are features that electric motors offer over diesel (Chandler, Espino, and O'Dea 2016).

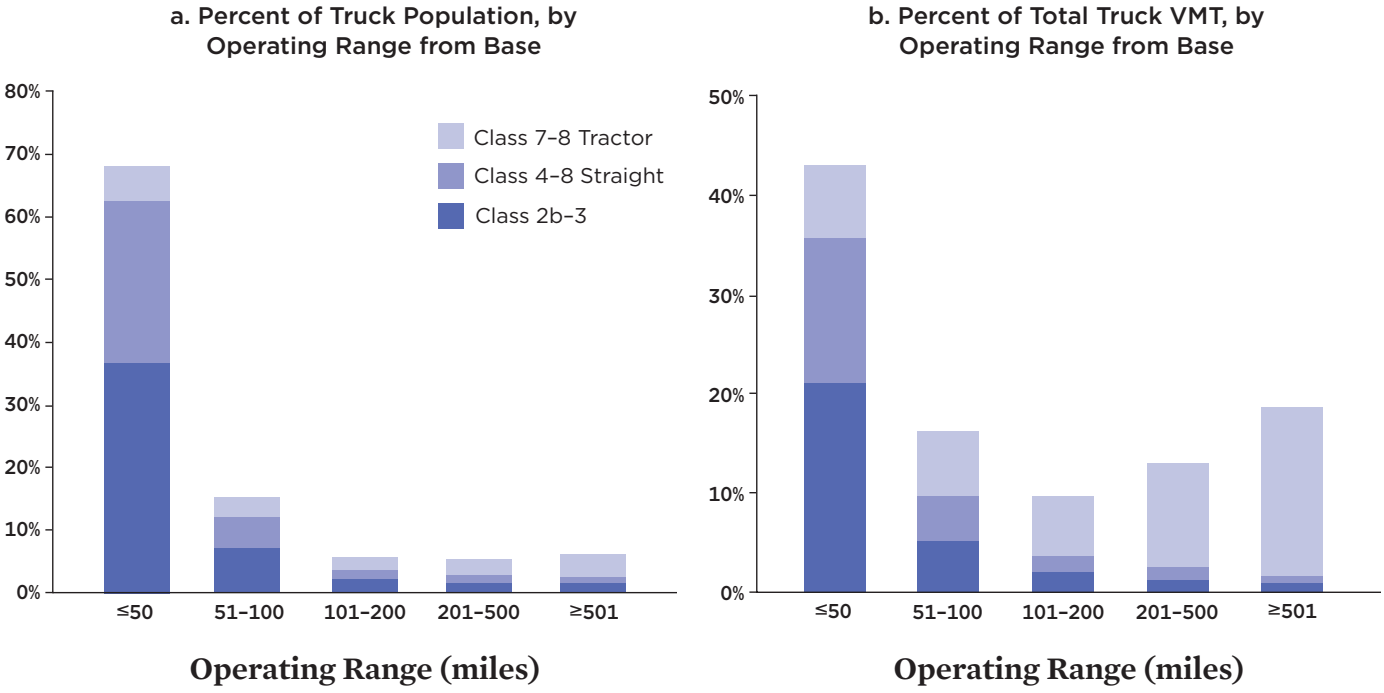
heavy-duty vehicles (Classes 2b–8) have diesel engines, compared with less than 1 percent of light-duty vehicles. In the heaviest of vehicle classes (e.g., semi trucks), nearly every vehicle is diesel-powered (Komanduri 2019).

ELECTRIFICATION CAN MEET MOST VEHICLES' NEEDS

A common question about electric vehicles is whether their range can meet the needs of a given application. The answer is yes; today's battery technology is suitable for many uses of trucks and buses.

Heavy-duty vehicles often travel to predictable destinations with consistent mileage, making them good candidates for electrification. Many trucks and buses operate over short urban routes and stop frequently (USCB 2004). Nationally, more than 80 percent of all heavy-duty trucks (Class 2b and above) have a primary operating range (the farthest distance from the vehicle's home base) of less than 100 miles; nearly 70 percent have an operating range of less than 50 miles (Figure 2).[4]

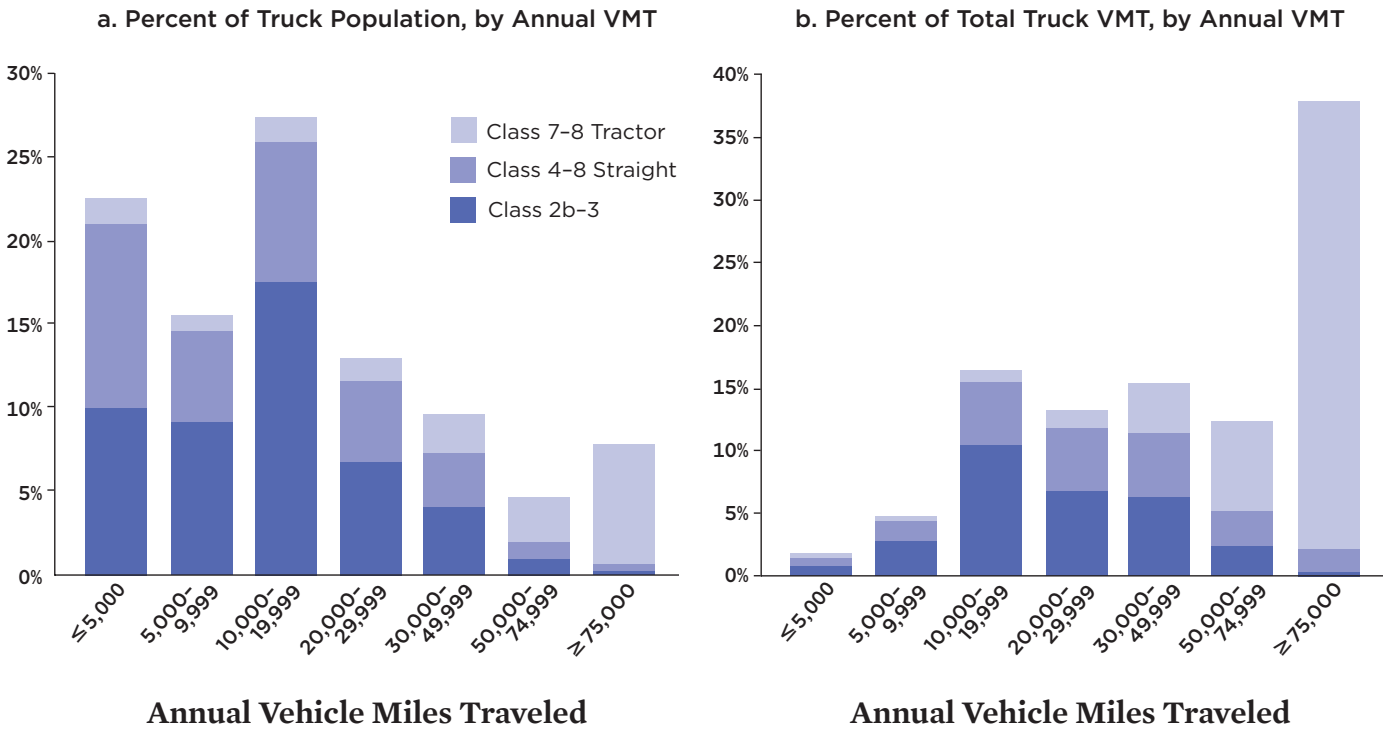
FIGURE 2. Operating Range of Heavy-Duty Trucks



Many heavy-duty trucks operate within 100-mile ranges (left), and many vehicle miles traveled (VMT) are attributable to trucks with operating ranges less than 100 miles (right). These trucks are particularly well-suited to early electrification efforts.

SOURCE: USCB 2004.

FIGURE 3. Annual Mileage of Heavy-Duty Trucks



Many trucks have annual mileages that suggest compatibility with today's battery and fuel cell technologies (left), although a small fraction of vehicles account for the bulk of the total miles traveled by trucks (right).

SOURCE: USCB 2004.

Data on annual mileage further illustrate the nature of trucks' daily operation. More than 75 percent of heavy-duty vehicles travel 30,000 miles or less each year (120 miles per day, assuming they operate five days per week and 50 weeks per year); 65 percent travel less than 20,000 miles each year (80 miles per day, assuming they operate five days per week and 50 weeks per year) (Figure 3). These daily distances are well within the range of existing heavy-duty electric vehicles on a single charge or tank of hydrogen—from roughly 90 miles to 500 miles or more, depending on the vehicle's make and model. Especially well-suited for electrification are fleet vehicles operating in defined areas and parked at central depots where they can recharge.

Conversely, a small percentage of vehicles, consisting almost exclusively of Class 7 and 8 semi, or tractor, trucks, travel many miles each year and account for a large fraction of the total miles traveled by heavy-duty vehicles. Vehicles with annual mileages greater than 50,000 miles (200 miles per day, assuming they operate five days per week and 50 weeks per year) make up about 10 percent of heavy-duty vehicles yet account for about 50 percent of the total miles traveled within this sector. However, many Class 7 and 8 tractors have lower annual mileages. A similar number of trucks in these categories travel less than 50,000 annual miles (45 percent) as trucks traveling more than 50,000 annual miles (55 percent).

> ***Heavy-duty vehicles often travel to predictable destinations with consistent mileage, making them good candidates for electrification.***

While semi trucks are often considered more challenging to electrify, several manufacturers (e.g., BYD, Daimler, Tesla, Volvo, Xos) have developed and are testing such vehicles in

real-world operations. These demonstrations are proving it is entirely possible to electrify a vehicle segment once thought a moonshot. And recent analyses indicate similar if not lower total costs of ownership for vehicles purchased within the next 5 to 10 years, if not earlier, for electric semi trucks compared with diesel, whether operating in long haul or regional contexts (CARB 2019a; Di Filippo, Callahan, and Golestani 2019; Hall and Lutsey 2019; ICF n.d.a.; Phadke et al. 2019).

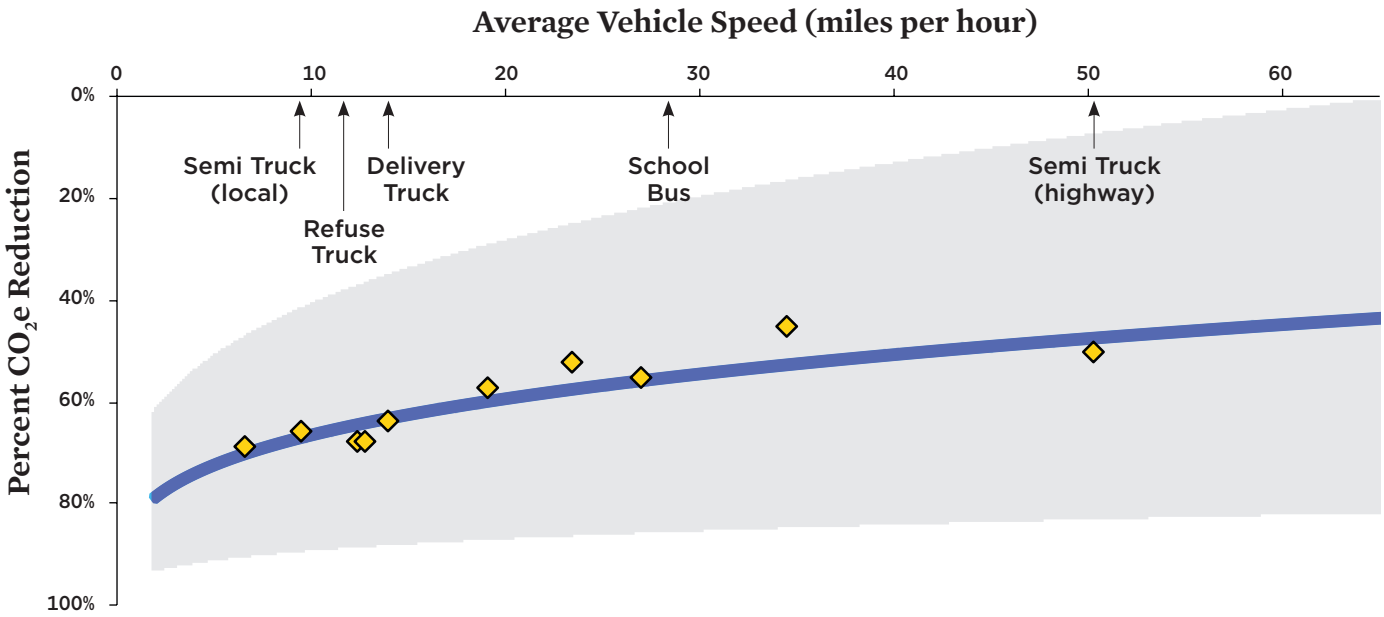
Figures 2 and 3 present average values. Some types of vehicles will operate above and others below those averages. For example, drayage trucks, which carry cargo to and from ports, railyards, and distribution centers, travel a wide range of distances depending on whether they operate near the port or travel to warehouses on the far side of the region they serve. But even considering the varied nature of truck and bus operations, the data indicate that today's technology offers opportunities for electrifying every type of heavy-duty vehicle.

ELECTRIC TRUCKS AND BUSES OFFER SIGNIFICANT CLIMATE AND AIR QUALITY BENEFITS

No matter the operating characteristics of the vehicle or electricity grid, battery-electric heavy-duty vehicles have lower global warming emissions than diesel vehicles (Figure 4). This advantage comes in addition to the public health benefits resulting from zero tailpipe emissions of harmful air pollutants such as particulate matter and nitrogen oxides.

The life cycle emissions of operating an electric vehicle compared with an internal combustion vehicle depend primarily on two factors: the vehicle's energy efficiency and the sources of electricity used to charge the vehicle. Battery-electric vehicles are considerably more energy efficient than diesel, natural gas, or gasoline vehicles, which is a major reason that electric vehicles have lower life cycle emissions than combustion vehicles, even though fossil fuels are the largest (yet declining) source of electricity in the United

FIGURE 4. Better for the Climate at Any Speed



No matter the electricity grid in the United States or the average vehicle speed, electric heavy-duty vehicles offer significant benefits toward minimizing global warming emissions compared with diesel heavy-duty vehicles. The efficiency benefits of electric heavy-duty vehicles are greatest at low average speeds, characterized by frequent acceleration and deceleration.

Notes: The gray band represents emissions reductions from the US electricity grid as a whole, from the most carbon-intensive (top edge) to the least carbon-intensive (bottom edge). The blue line shows emissions reductions of an electric vehicle on the average grid in the United States. Diamonds represent findings from studies of the energy efficiency improvements of battery-electric heavy-duty vehicles compared with diesel vehicles for a range of average speeds. Arrows show representative average speeds for different types of heavy-duty vehicles. The average speeds for the trucks listed above were determined as follows: refuse truck corresponds to real-world data collected from the operation of six front-loader trucks; delivery truck corresponds to a Class 5 stepvan tested on the Hybrid Truck Users Forum Parcel Delivery Class 4 (HTUF4) drive cycle; school bus corresponds to a 72-passenger bus tested on the Urban Driving Dynamometer Schedule for Heavy Duty Vehicles (UDDSHDV) drive cycle; local and highway semi trucks correspond to drive cycles designed to simulate drayage truck operations.

SOURCES: CARB 2018B; EPA 2018B; SANDHU ET AL. 2014; BARNITT AND GONDER 2011.

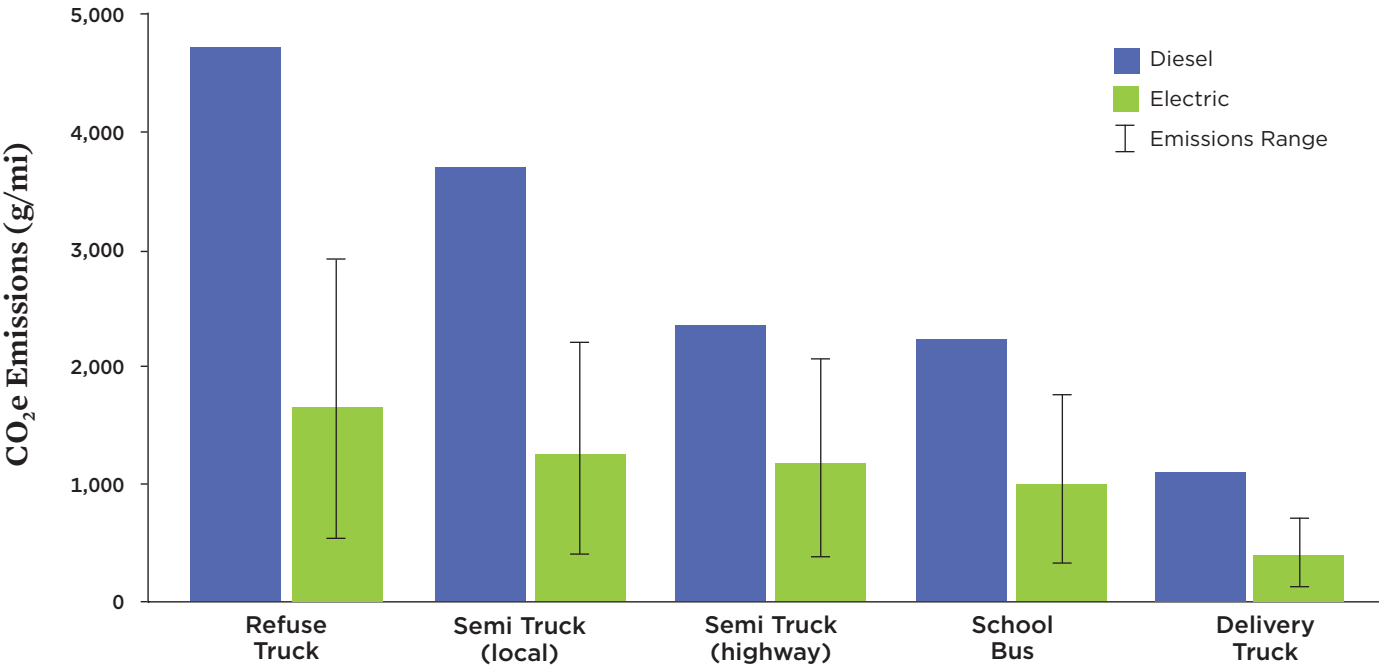
States (EIA 2019c). For trips involving frequent stopping, accelerating, or idling (average speeds of about 10 miles per hour or less), heavy-duty battery-electric vehicles are five to seven times more efficient than diesel vehicles. Even at highway speeds, heavy-duty battery-electric vehicles are 3.5 times more efficient (CARB 2018b).

The poor efficiency of combustion engines is recognizable in the heat emanating from their engines and exhausts. The heat represents chemical energy in the fuel (gasoline, diesel, or natural gas) that was not converted into mechanical energy to propel the vehicle. Energy losses are much smaller with battery-electric vehicles.

The Union of Concerned Scientists has documented the climate benefits that electric cars and transit buses offer over their combustion counterparts on all electricity grid regions in the United States (Nealer, Reichmuth, and Anair 2015; O'Dea 2018a; Reichmuth 2018). The same benefits arise for other types of heavy-duty vehicles, including delivery trucks, refuse trucks, school buses, and drayage trucks. Combining energy efficiencies for a range of vehicle types and operating characteristics with the global warming emissions associated with electricity production in every US grid region, Figure 4 shows the emissions reductions of electric vehicles traveling at average speeds ranging from 2 to 65 miles per hour (CARB 2018b).[5]

With the average sources of electricity in the United States, a heavy-duty electric vehicle reduces global warming emissions by 44 to 79 percent depending on a vehicle's average speed over the course of its trip (see the blue line in Figure 4). Using estimates of average speeds for different types of vehicles, Figure 5 shows that electric delivery trucks, refuse trucks, and locally operating semi trucks offer 65 percent reductions compared with equivalent diesel vehicles; electric semi trucks with highway-based operations and school buses offer 50 percent reductions in global warming emissions. Figure 6 (p. 8) shows the emissions reductions for a delivery truck operating in all grid regions across the

FIGURE 5. Life Cycle Global Warming Emissions for Different Heavy-Duty Electric Vehicles on the Average US Grid (generation-weighted) in 2016

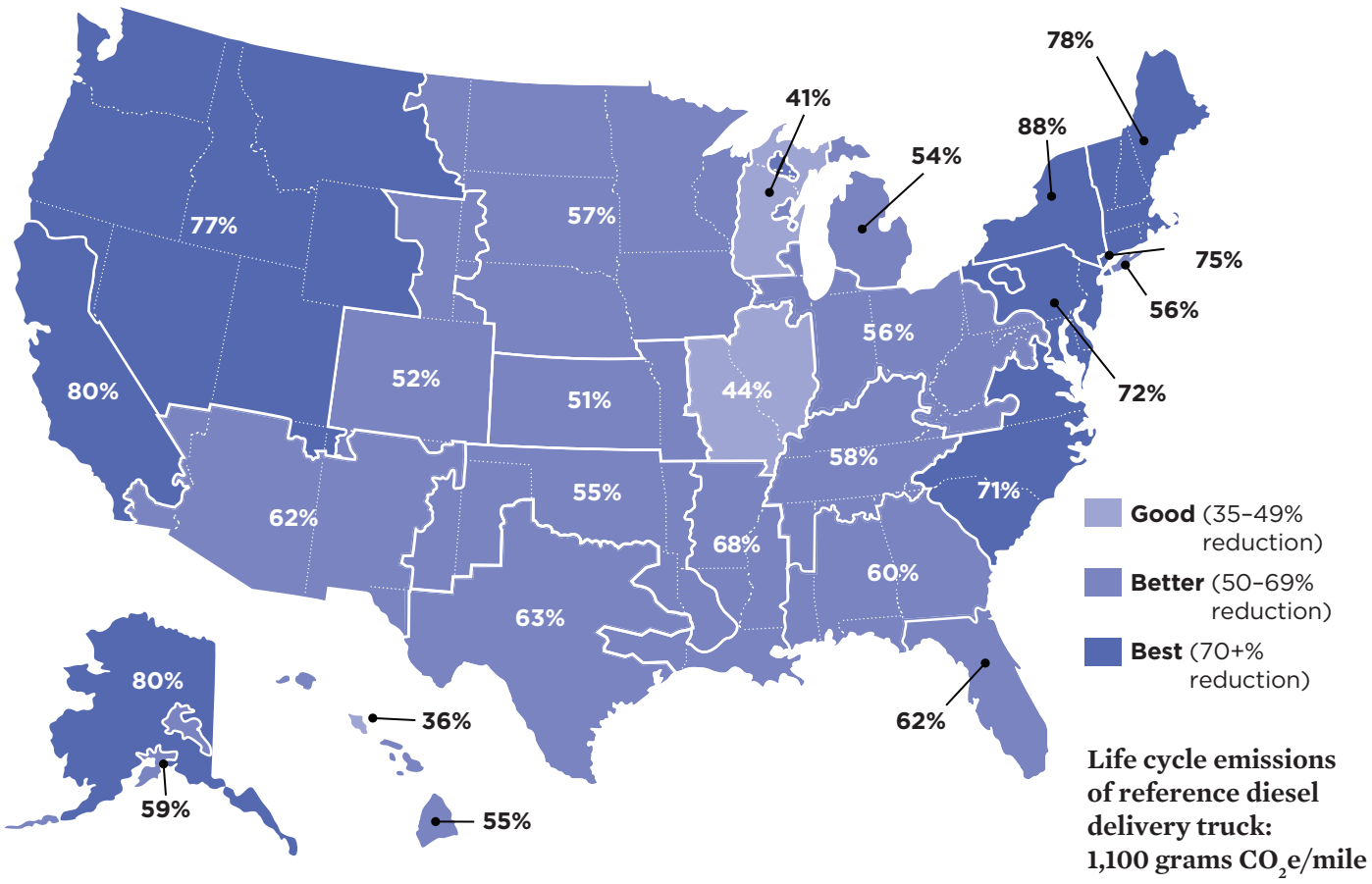


Per-mile life cycle global warming emissions vary for different types of heavy-duty vehicles depending on a vehicle's fuel efficiency. Shown are life cycle emissions from diesel and electric versions of five common heavy-duty vehicles. Bars for electric vehicles represent life cycle global warming emissions for vehicles charged on the average grid in the United States. Range bars represent emissions from the most and least carbon-intensive electricity grids in the United States.

Note: Fuel economies for the electric refuse truck and school bus were estimated based on the fuel economy of the corresponding diesel vehicle and its average speed. Fuel economies for the electric delivery truck and semi trucks were measured directly.

SOURCES: CARB 2018B; EPA 2018B; SANDHU ET AL. 2014; BARNITT AND GONDER 2011.

FIGURE 6. Electric Delivery Trucks Offer Significant Reductions in Life Cycle Global Warming Emissions in All Grid Regions of the United States



This map shows life cycle global warming emissions as a function of different sources of electricity for a common type of delivery truck (Class 5 stepvan). Percentages represent emissions reductions for the electric delivery truck compared with a similar diesel delivery truck.

SOURCES: CARB 2018B; EPA 2018B; SANDHU ET AL. 2014; BARNITT AND GONDER 2011.

United States, ranging from 36 percent to 88 percent lower life cycle global warming emissions than a diesel delivery truck.

> ***No matter the operating characteristics of the vehicle or electricity grid, battery-electric heavy-duty vehicles have lower global warming emissions than diesel vehicles.***

As the grid continues to become cleaner through commitments by states such as Hawaii, California, Nevada, New Mexico, Washington, and New York, emissions from electric vehicles will continue to decline (DSIRE 2019; Reichmuth 2018). From 2009 to 2016, global warming emissions from the production of electricity decreased by 18 percent, from 1,222 pounds CO_2e per megawatt-hour (lb/MWh) to 1,004 lb/MWh (EPA 2018b).

A Growing Market for Heavy-Duty Electric Vehicles

The availability of heavy-duty electric vehicles has grown rapidly in recent years (Figure 7; also see the Appendix at *www.ucsusa.org/resources/ready-work*). In the United States,

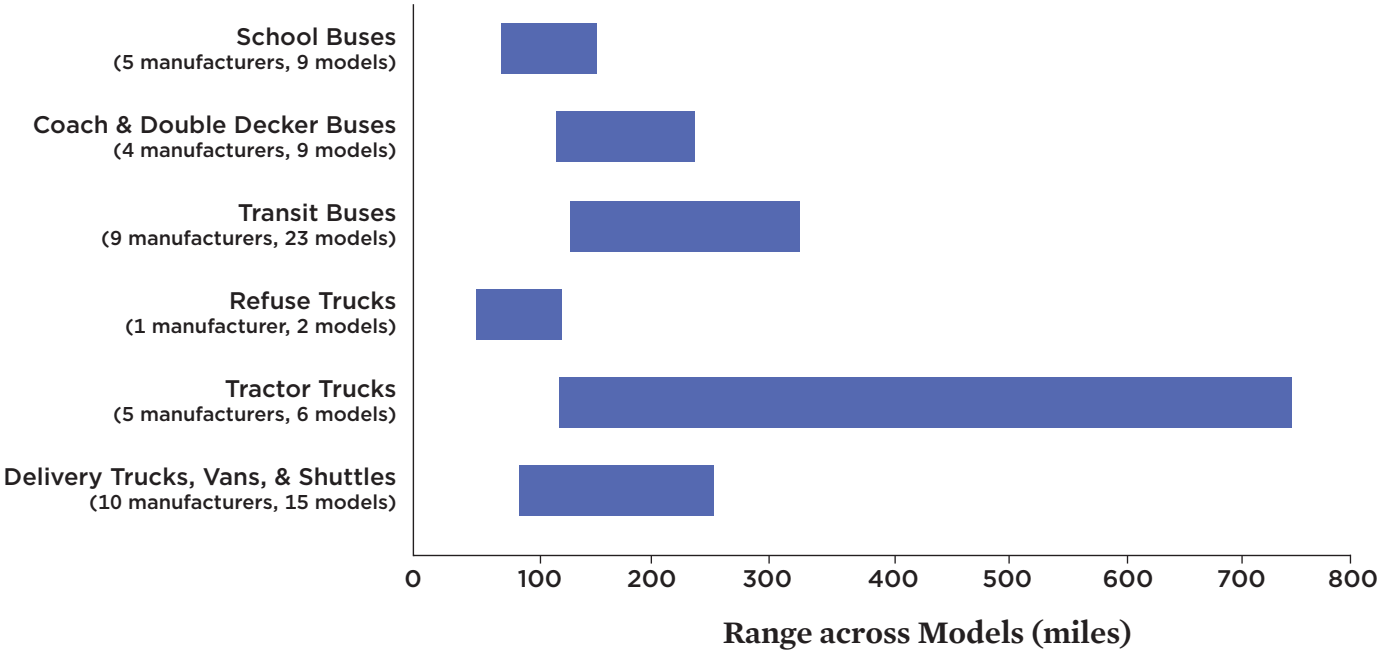
there are 70 models and counting—from 27 manufacturers—of electric trucks and buses that are available today or with production announced for the next two years (see Appendix). In 2014, eight manufacturers offered 25 models of electric trucks and buses that were eligible for purchase incentives in California (HVIP 2015).

As an indicator of rapid progress in the transit bus industry, three manufacturers (BYD, New Flyer, and Proterra) offer vehicles with ranges up to, if not beyond, 200 miles, depending on the operating conditions. Five manufacturers of school buses offer electric versions, including established manufacturers and new entrants. Ten different manufacturers offer electric trucks in the delivery truck and straight truck categories. Product choices are limited for Class 7 and Class 8 trucks, yet eight manufacturers are beginning to deploy and test vehicles in these large truck categories.

New entrants dominate the heavy-duty electric vehicle market, but traditional truck manufacturers appear to be ramping up efforts on electric vehicles as well. Some of the new entrants are large companies, such as BYD and Tesla, that also produce light-duty electric vehicles. Other companies are less well-known but quickly establishing themselves. Still others are "upfitters," smaller companies filling a critical void left by original equipment manufacturers that do not offer electric versions of their vehicles. Upfitters take vehicles made by companies like Ford or GM and replace the engine with an electric drivetrain.[6] With this business model,

> ***In the United States, there are 70 models of electric trucks and buses, from 27 manufacturers, that are available today or with production announced for the next two years.***

FIGURE 7. Electric Trucks and Buses Fit Many Needs



Multiple manufacturers have electric heavy-duty trucks and buses on the road today or targeted for production within the next one to two years. The battery ranges offered by these vehicles provide numerous options for companies and municipalities interested in switching from diesel to electric models.

Notes: Mileage ranges represent the maximum value provided by manufacturers. The number of models includes those currently available for purchase and those announced for production by 2021. Excluded from the figure are yard trucks (four models available from four manufacturers) and street sweepers (two models available from one manufacturer), for which battery range is measured in hours of operation instead of miles, as well as models for which future availability is unknown. See the Appendix for detailed information on individual model ranges, battery capacity, and production status.

Jimmy O'Dea/UCS

Four manufacturers already offer electric versions of yard trucks, which move cargo containers within port, railyard, and warehouse complexes.

customers that want a Ford or Chevy truck can get it in an electric version. The disadvantage is scale, but as upfitters have established their expertise on electric drivetrains and electronics, they are beginning to partner with large vehicle manufacturers to build electric vehicles on assembly lines; this will greatly increase production rates.

ADOPTION COULD COME FAST

While deployment of heavy-duty electric vehicles on US roads lags that of electric passenger vehicles, progress in the transit bus industry is one indicator of the rate at which other heavy-duty electric vehicles could also be adopted. In the United States, electric transit buses already account for 10 percent of annual sales.[7] In contrast, passenger electric vehicles represented less than 2 percent of national automobile sales in 2018 (Auto Alliance n.d.). The rapid early adoption of electric buses stems largely from the significant investments and financial incentives provided by state and federal policies.

While electric trucks have yet to account for a significant fraction of sales in the United States, China's adoption of heavy-duty electric vehicles also indicates how quickly a transition can be made. More than 400,000 electric transit buses have been sold in China since 2012 (Albanese 2019; Eckhouse 2019). The city of Shenzhen alone has 16,000 electric transit buses (Keegan 2018). Even larger has been that city's deployment of electric vans and delivery trucks. From 2015 through 2018, Shenzhen's fleet of these vehicles expanded from nearly zero to more than 60,000. Electric models now represent about 35 percent of the city's urban delivery vehicles (McLane and Mullaney 2019).

ENERGY USE WILL SIGNIFICANTLY DECREASE, WHILE ELECTRICITY NEEDS WILL MODERATELY INCREASE

Transitioning from diesel and gasoline to electricity as the fuel for trucks and buses will decrease demand for the former fuels, and it will increase demand for electricity and hydrogen. If all trucks in the United States were suddenly battery-electric, the energy needed to power them would decline significantly. This is because electric vehicles are much more efficient than diesel, natural gas, and gasoline vehicles.

To power all these vehicles would increase overall electricity consumption. In 2017, heavy-duty vehicles on US roads consumed roughly 41 billion gallons of diesel and 10 billion gallons of gasoline (EIA 2019d). From these values, it is possible to estimate the amount of energy required to power these vehicles if they were electric. Using a vehicle

efficiency improvement of four times for electric compared with diesel and accounting for efficiency losses in the transmission of electricity (6 percent) and efficiency losses associated with charging a vehicle (10 percent), it would take 560 terawatt-hours (TWh) of electricity to power all heavy-duty trucks in the United States with electricity.[8] This would represent a 13 percent increase in electricity generation compared with the 4,200 TWh used in the United States in 2017, but a 71 percent decrease in energy compared to the consumption of diesel and gasoline by heavy-duty vehicles (1,900 TWh) (EIA n.d.a; EIA n.d.b). For a sense of scale, the residential sector consumed nearly 1,400 TWh of electricity in 2017; air conditioning alone consumed more than 200 TWh (EIA n.d.c; EIA n.d.d).

Of course, electrification of trucks and buses will not occur all at once. Electrifying 10 percent of the diesel fleet over a decade would increase electricity demand similarly to the rise in demand from data servers, which increased from 35 TWh in 2000 to 70 TWh in 2008 (and then leveled off as the energy efficiency of data servers improved) (Azevedo et al. 2016). Consider, too, the speed at which the United States has added clean sources of electricity: annual generation from wind and solar increased more than 300 TWh from 2008 to 2018 (EIA 2019e).

Improving the utilization of existing sources of electricity can minimize the need for new power plants to meet increased demand from electric vehicles. Because the electricity grid is designed to accommodate the highest demand experienced on it, much of its generation capacity sits idle during periods of non-peak demand. Electric vehicles can use the idle capacity if they charge at off-peak times such as when solar or wind generate excess electricity. Better utilization of grid capacity spreads fixed costs (for example, transmission lines) over increased electricity sales, which lowers electricity rates for all customers (CUB n.d.).

Electric vehicles can provide grid services in addition to utilizing idle or curtailed generation resources. Charging at off-peak times or times of high renewable electricity generation can level out daily energy demands and reduce the need for ramping electricity generation up or down, periods that generate significant emissions (Wisland 2018). The need to reduce extreme power ramping is particularly acute in places such as California, with significant deployment of solar energy and large peaks and valleys in the daily electricity demand. Electricity rates that are lower during off-peak periods can encourage owners of electric trucks and buses to charge at times that are beneficial to the grid.

A unique aspect of electric trucks and buses compared with cars is the larger amount of instantaneous energy (power) required for charging their larger batteries. Cars currently charge at rates from 5 kW to 250 kW, with home and workplace charging falling on the slow end and "DC fast chargers," typically located at travel stops or public charging stations, representing the fast end. For trucks and buses, whose batteries can store anywhere from 2 to 10 times the amount of energy simply by having more battery cells, rates of 20 kW to 200 kW are used for overnight charging depending on the size of the vehicle's battery. Even faster on-route chargers used by some transit buses charge at 150 kW to 400 kW (Proterra 2019). Charging at lower power rates and at times with lower demand from other sources is optimal for the grid. One strategy that can lessen impacts on the grid is to charge a vehicle's battery from stationary batteries built into charging stations.

The Economic Case for Heavy-Duty Electric Vehicles

Fuel and maintenance savings can offset the higher upfront costs of heavy-duty electric vehicles, making them cheaper than a diesel or natural gas vehicle over the life of a vehicle. This is especially the case for higher mileage truck and bus applications: for these, fuel costs can greatly exceed vehicle costs—more than twice as much depending on the application. The economics shift even further in favor of electric vehicles as the prices of batteries and fuel cells decrease and the prices of diesel and natural gas engines increase to meet clean air standards.

> ***Depending on the application, battery-electric trucks can be cost-competitive today.***

Depending on the application, battery-electric trucks can be cost competitive with diesel today on a total-cost-of-ownership basis. In nearly every vehicle case examined, including long-haul semi trucks, battery-electric trucks and buses are cheaper than diesel vehicles on a total-cost-of-ownership basis for vehicles purchased within the next 10 years (CARB 2019a; Hall and Lutsey 2019; ICF n.d.a.; Phadke et al. 2019). Those are the conclusions of recent analyses conducted by the California Air Resources Board, the International Council on Clean Transportation, and ICF. The studies, summarized in Figures 8 and 9, analyzed the total cost of ownership for vehicles purchased today and in 2030 for Class 6 delivery trucks and Class 8 short-haul semi trucks. All three

studies reached similar conclusions despite different assumptions for many parameters including vehicle purchase prices, annual mileage, years of vehicle ownership, maintenance costs, electricity rates, and vehicle fuel efficiencies.

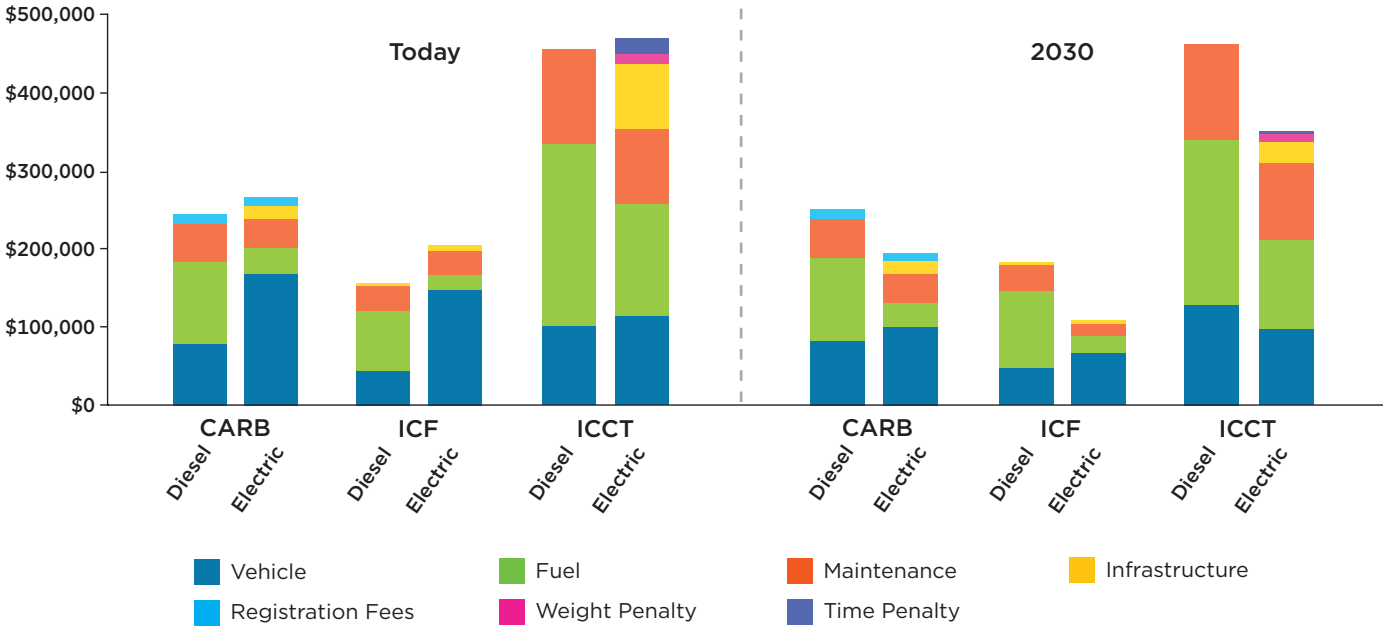
The largest impact comes from savings on fuel costs: compared with diesel, electricity reduces fuel costs an estimated 30 to 75 percent, depending on assumptions for vehicle efficiency and fuel prices. In most scenarios examined, the vehicle purchase price remains higher than that of its diesel counterpart through 2030, yet total ownership costs are significantly lower.

All three analyses focus on California, which allows for comparable assumptions for electricity rates and diesel costs. Otherwise, the cost assumptions apply to all markets in the United States.[9] Given that California's electricity rates are among the nation's highest, electric vehicles would offer even greater fuel savings elsewhere.[10]

While California's policies and incentives significantly offset the costs of vehicle purchases, fuel, and charging infrastructure, Figures 8 and 9 exclude these financial benefits as they are not currently available in other states (HVIP 2019; O'Dea 2019a; Barbose and Martin 2018). With California's policies and incentives, however, the total cost of ownership is lower than diesel today for 19 of 20 vehicle scenarios examined in the three studies. The scenarios include several types of delivery trucks, semi trucks, transit buses, and school buses. Vehicle applications with the least savings are those with lower annual mileages and higher operating speeds, which offer less improvement in fuel efficiency compared with diesel vehicles. California's Low Carbon Fuel Standard, which financially penalizes fuels with carbon intensities above a set standard and rewards fuels below it, can lower the electricity rates for heavy-duty vehicles approximately $0.09 to $0.14 per kWh today and $0.07 to $0.12 per kWh in 2030, depending on the fuel efficiency improvements of an electric vehicle compared with a diesel vehicle.[11]

The three studies also examined the total cost of ownership for hydrogen fuel cell vehicles (not shown in Figures 8 and 9). Fuel cell vehicles have higher total costs of ownership compared with battery-electric vehicles across all vehicle types today. Significant reductions in the costs of fuel cells

FIGURE 8. Total Cost Comparisons, Class 6 Delivery Trucks

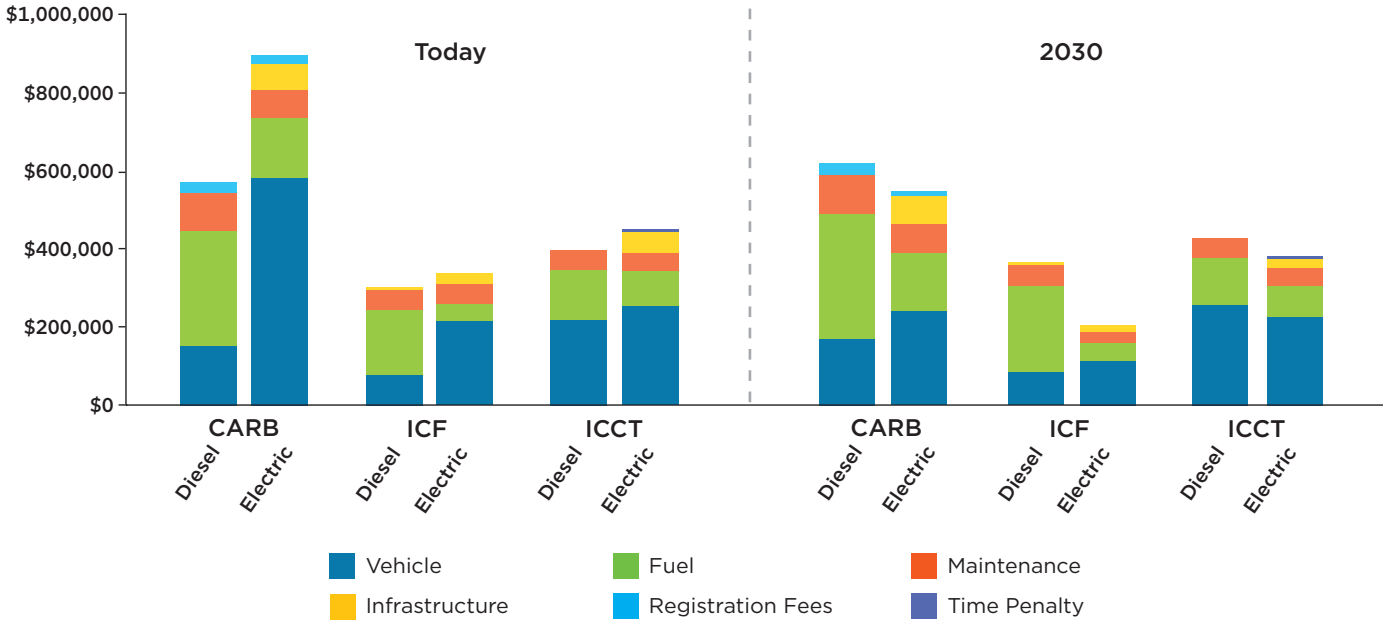


The total cost of ownership for Class 6 electric delivery trucks is competitive with diesel vehicles today and estimated to be significantly lower within the next decade.

Notes: In the ICCT study, "today" corresponds to 2020; in the CARB and ICF studies, 2018. Vehicle costs in the ICF and CARB analyses account for the residual value of the vehicle at the end of its assumed period of ownership.

SOURCES: HALL AND LUTSEY 2019; ICF N.D.A, CARB 2019A.

FIGURE 9. Total Cost Comparisons, Class 8 Short-Haul/Drayage Trucks



The total cost of ownership for Class 8 electric short-haul/drayage trucks can be lower than diesel today with financial incentives, and is estimated to be lower for diesel trucks within the next decade without such incentives.

Notes: In the ICCT study, "today" corresponds to 2020; in the CARB and ICF studies, 2018. Vehicle costs in the ICF and CARB analyses account for the residual value of the vehicle at the end of its assumed period of ownership.

SOURCES: HALL AND LUTSEY 2019; ICF N.D.A, CARB 2019A.

and hydrogen are needed for these vehicles to compete with diesel vehicles (see Box 3).

How to Get More Electric Trucks and Buses on the Road

Considering their local operating characteristics, the range of today's battery technologies, and similar if not reduced ownership costs, widespread electrification makes immediate sense in several classes of heavy-duty vehicles. However, internal combustion engines have dominated the truck and bus marketplace for more than a century, presenting significant barriers to transforming these markets. Policies are needed to shift from an industry dominated by diesel to one powered by electricity or hydrogen.

Three types of policy are important to deploying heavy-duty electric vehicles: financial incentives, infrastructure investments, and manufacturing and purchasing standards. All of these policies must center on improving air quality in communities most burdened by pollution from vehicles.

FINANCIAL INCENTIVES

Overcoming the higher upfront cost of electric trucks is an important strategy for increasing their adoption. For example, a federal tax credit that provides up to $7,500 has been key

BOX 3.

What About Fuel Cells?

Batteries and fuel cells both generate electricity that an electric motor converts to mechanical energy to move a vehicle. Batteries use compounds of lithium and graphite to produce electricity, while fuel cells produce electricity from hydrogen and oxygen gases. Both types of electric vehicles have zero tailpipe emissions and are significantly more energy efficient than heavy-duty vehicles powered by diesel or natural gas. The main advantage of fuel cells over batteries are shorter fueling times, but higher vehicle and fuel prices have slowed their commercialization compared with battery electric vehicles.

Jimmy O'Dea/UCS

Electric school buses can reduce global warming emissions by about 50 percent compared with diesel buses, based on the US average grid mix. Five manufacturers offer electric school buses today.

in reducing the upfront cost of passenger electric vehicles. No similar federal policy exists for electric trucks and buses, but California's Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP) has demonstrated that incentives to lower the upfront cost of electric vehicles can accelerate adoption. This program has funded more than 2,400 electric vehicles over the past nine years and vehicle demand annually exceeds the allocated state funding (CARB 2019b).

Policy strategies to reduce the upfront costs of electric trucks and buses include establishing federal and state tax credits or rebates, or waiving federal, state, and local sales taxes for the purchase of these vehicles. While 11 states and Washington, DC, have incentives for buying electric passenger vehicles, only California, Colorado, New York, Texas, and Utah offer incentives for buying heavy-duty electric vehicles (Colorado Department of Revenue 2019; HVIP 2019; NYTVIP n.d.; Tesla n.d.; TCEQ n.d.; 59 Utah Code).[12] Other states could do this also, and design programs to ensure deployment of electric trucks and buses occurs in communities most affected by air pollution. Requirements for the amount of funding that benefits these communities and higher incentives for electric trucks and buses deployed there, as set forth in California's HVIP program, can ensure that air quality benefits occur where they are needed most.

In addition to reducing upfront costs, incentives to lower the operating expenses of electric vehicles compared with diesel can also help make a more compelling business case to go electric. Several policy strategies exist in this regard.

Ensure fair and reasonable electric utility rates for truck and bus charging: Most commercial electricity rates

> ***Electric utilities and utility regulators should ensure that heavy-duty vehicle operators have access to fair rates that account for these vehicles' demands and benefits to the grid.***

were designed without electric trucks and buses in mind. However, these vehicles place different demands on, and offer different services to, the electricity grid compared with buildings and equipment traditionally associated with commercial electricity use (Houston 2019). Electric utilities and utility regulators should ensure that heavy-duty vehicle operators have access to fair rates that account for these vehicles' demands and benefits to the electric grid. Such rates would provide the opportunity for vehicle operators to save on fuel costs, especially operators that charge trucks or buses at off-peak times and during periods when renewable electricity generation is high.

Establish state-level clean fuels standards: In state programs like California's Low Carbon Fuel Standard and Oregon's Clean Fuel Program, fleets can earn clean-fuel credits for electric operation and sell those into a credit market (Barbose and Martin 2018). The credits can add up. For example, an electric transit bus in California can generate

Dennis Schroeder/NREL

Powering trucks and buses with electricity is not only better for the climate than diesel—even in the most carbon-intensive electricity grid regions of the United States—but also offers significant savings in fuel costs.

more than $10,000 of credits annually, lowering its electricity rate by $0.14 per kWh.

Include electricity in federal fuels policy: Current federal policy supports increased use of biodiesel and biomethane, but it does not provide equivalent support for the use of electricity, even if that electricity is produced from biomethane. Creating pathways for electricity under existing or future fuels policy would provide incentives for electrification commensurate with those available to biodiesel and biomethane.

Create low- or zero-emissions zones: Cities seeking to accelerate the adoption of electric trucks could implement fees on higher-emitting trucks or provide preferred access to electric trucks. The Port of Los Angeles and the Port of Long Beach have committed to plans that will charge diesel and natural gas trucks to access the ports, while exempting electric trucks. While the strategy is not prevalent in the United States, low-emissions zones, where fees or exclusions apply to higher polluting commercial vehicles, are prominent in European cities (European Union n.d.). Similarly, states can incentivize electric truck adoption by reducing or waiving annual registration fees.

INVESTMENTS IN CHARGING INFRASTRUCTURE

Successfully deploying electric trucks will require investments in charging infrastructure. In the near term, financial support for installing charging infrastructure can encourage fleets to adopt electric trucks and reduce the upfront costs of transitioning to electric vehicles. Utilities' and utility regulators' support for investments in charging infrastructure can catalyze truck electrification as can federal policy.

Utility investments: In addition to offering fair and affordable electricity rates, utilities have a significant role to play in the widespread electrification of heavy-duty vehicles by investing in charging infrastructure (Houston 2019). Many utilities have begun implementing programs to facilitate the adoption of electric trucks and buses. These include installing and upgrading infrastructure on customers' sites (upgrading electric panels, trenching, installing wiring) or offering rebates for infrastructure improvements. Utilities could also consider financing options that allow their customers to pay back the cost of infrastructure installations on future utility bills. Such programs should provide greater support for charging facilities in communities affected by pollution to ensure that clean air benefits come where they are most needed.

State and federal support for truck charging infrastructure: For electric trucks to reach their potential, publicly accessible charging/fueling sites on major travel corridors will need to complement depot-based charging and hydrogen fueling infrastructure. For example, the West Coast Clean Transit Corridor is a regional effort by several utilities and agencies across state lines to determine the infrastructure needs for long-haul electric trucking on the Interstate 5 corridor (SMUD 2019). State and federal policymakers can support such efforts by providing grants or other financial incentives to promote coordination and spur the installation of robust charging networks.

> ***Utilities have a significant role to play in the widespread electrification of heavy-duty vehicles.***

GOALS AND STANDARDS

While financial incentives can encourage the early adoption of technologies, it also will take standards, laws, and regulatory measures to accelerate the adoption of electric trucks and buses. This "carrot and stick" strategy has succeeded in the market for passenger electric vehicles. California's disproportionate share of electric cars in the United States illustrates the impact of these strategies. Despite having 11 percent of US vehicles and 12 percent of the nation's population, California has roughly 50 percent of the million-plus electric cars sold in the country (including plug-in hybrids) (FHWA 2019; Auto Alliance n.d.; USCB n.d.).

The main reason California is a leader in electric cars is state policy (UCS 2019). In addition to incentive and infrastructure policies, California requires car manufacturers to sell electric vehicles in the state, and it is considering a similar requirement for truck manufacturers.

Beyond such a requirement, policymakers can consider ways to compel fleets—whether public or private—to transition to electric. California recently adopted measures to require transit agencies and companies operating airport shuttle buses to move toward electrifying their fleets over the next decade (O'Dea 2019b; O'Dea 2018b). Similar measures targeting port drayage trucks and delivery vehicles are expected.

Local governments can also adopt policies for electrifying municipal trucks and buses. Contracts for refuse services or school bus services could include targets for deploying electric vehicles. Several transit agencies' boards have approved plans to transition their entire fleets to electric. Such fleet requirements can increase sales volumes, and thereby lower costs, and drive investments in charging infrastructure. In all, no one policy will lead to the widespread electrification

of trucks and buses. Instead it will take key policies that lower costs, support charging infrastructure, and set standards for the availability and adoption of electric trucks and buses.

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ENDNOTES

1 *Transportation emissions exclude those related to the production of fuels (e.g., diesel and gasoline). On-road sources of emissions represent 24 percent of total US global warming emissions; aircraft, ships, boats, rail, pipelines, and lubricants comprise 5 percent. Heavy-duty vehicles defined in the EPA's emissions inventory include vehicles with gross vehicle ratings of 8,501 pounds (Class 2b) and above. For consistency with vehicle population and NO_x and $PM_{2.5}$ emissions, global warming emissions represent data from 2014. For the latest data available (2017), the fraction of global warming emissions from heavy-duty vehicles relative to all on-road vehicles (30 percent) remains similar to the 2014 values cited in the text. Overall emissions from both heavy- and light-duty vehicles increased from 2014 to 2017, from 421 to 451 million metric tons of CO_2e (EPA 2019).*

2 *The population of Class 2b–8 heavy-duty vehicles was determined by combining an estimate of the Class 2b population (13.1 million vehicles) from the US Department of Energy and the Class 3–8 population (12.9 million vehicles) from the Federal Highway Administration, including buses (EIA 2016; FHWA 2016). Vehicle population represents that in 2014 to match the latest NO_x and $PM_{2.5}$ emissions data. Using data from the EIA's 2019 Annual Energy Outlook and the FHWA's Highway Statistics 2017, the population of Class 2b and Class 3–8 vehicles in 2017, the latest data available, is 13.8 million vehicles for each category, or 10 percent of total vehicles as in 2014 (EIA 2019a; FHWA 2019). Previous UCS analyses found Class 2b–8 vehicles comprise 7 percent of total vehicles (Chandler, Espino, and O'Dea 2016; Cooke 2015). Data in the EIA's 2016 Annual Energy Outlook and later show significantly more Class 2b vehicles than previously estimated, explaining the increase.*

3 *Transportation, including off-road modes, is the largest source of NO_x emissions in the United States. Heavy-duty vehicles account for 30 percent of the transportation sector's NO_x emissions and 16 percent of all NO_x emissions. For $PM_{2.5}$, heavy-duty vehicles account for 28 percent of transportation's emissions, but less than 2 percent of all $PM_{2.5}$ emissions including dust and fire sources (EPA 2018a). Diesel particulate matter, however, remains a critical pollutant to minimize as it has been classified as a carcinogen by the World Health Organization (CARB n.d.).*

4 *Excluding Class 2b vehicles does not significantly affect the fraction of vehicles with operating ranges less than 50 or 100 miles. Eighty percent of Class 3–8 trucks have a primary operating range of less than 100 miles; 63 percent have an operating range of less than 50 miles. An updated survey of heavy-duty vehicles in California found similar weighted-distributions of vehicle population (by truck class and vehicle age) and vehicle miles traveled (by truck class, but not commodity) from 2002 and 2017, suggesting results from the 2002 vehicle inventory and use survey (VIUS) still roughly reflect present-day trends in the truck industry in the absence of a newer national VIUS and despite a small sample size for pickup trucks in the 2002 survey (Komanduri 2019; Birky et al. 2017).*

5 *The average truck speed on interstate highways is 50 to 60 miles per hour (DOT n.d.; EERE n.d.).*

6 *Sometimes the company arranges to procure vehicles without the engine, which is preferable.*

7 *Annual sales of standard and articulated transit buses averaged 4,400 per year over the last five years (2012–2016) (FTA 2018). This number of sales reflects a 14-year lifespan, or a 7 percent annual turnover compared with the 63,300 total buses. The number of electric buses awarded, as tracked by the Center for Transportation and the Environment, increased from roughly 400 in 2015 to 800 in 2016, 1,200 in 2017, and 1,600 in 2018 (Raudebaugh 2018). The number of electric buses deployed, awarded, or on order as tracked by CALSTART increased from 1,650 in 2018 to 2,255 in 2019 (Silver, Jackson, and Lee 2019; Popel 2018). Whether considering just new awards or a combination of new awards, orders, and deployed buses, sales of electric buses already exceed 10 percent of annual sales.*

8 *Electric heavy-duty vehicles are three to eight times more energy efficient than comparable diesel vehicles, depending on the nature of the vehicle's operation, namely its average speed (CARB 2018b).*

9 *The CARB and ICF analyses used statewide averages for electricity rates; the ICCT study used rates specific to Southern California Edison.*

10 *Only Alaska and Hawaii have higher electricity rates than California. Connecticut has similar if not slightly lower electricity rates than California. Electricity is roughly 50 percent cheaper in most other states compared with California (EIA n.d.e). While diesel is also more expensive in California than other states, the price differential is less than electricity, roughly 15 percent (EIA n.d.f).*

11 *Estimates of Low Carbon Fuel Standard revenues use credit values of $100 per metric ton of CO_2e and a carbon intensity of electricity in California of 93.11 grams CO_2e per megajoule (MJ) in 2019 (based on the California Energy Commission's grid mix for 2019), and 54.43 grams CO_2e per MJ in 2030 (based on the California Public Utilities Commission's Integrated Resource Plan) (ICF n.d.b.).*

12 *State incentives for the purchase of electric vehicles listed in the text exclude programs funded through the Volkswagen Environmental Mitigation Trust. Maine offers incentives for the purchase of electric passenger vehicles with this funding and several states offer incentives for the purchase of electric trucks and buses with this funding (Efficiency Maine n.d.).*

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EARTHJUSTICE

February 20, 2024

Diana Robinson
Planning Division Manager
Imperial County Planning & Development Services Department
801 Main Street
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Via email: DianaRobinson@co.imperial.ca.us

Re: Scoping Comments on Proposed Lithium Valley Specific Plan and Program Environmental Impact Report

Dear Ms. Robinson:

Thank you for the opportunity to provide scoping comments on the proposed Lithium Valley Specific Plan (Specific Plan) and related proposal to prepare a program environmental impact report (PEIR) under the California Environmental Quality Act (CEQA).

Earthjustice is a 501(c)(3) nonprofit public interest environmental law organization. We use the power of law and the strength of partnership to protect people's health, preserve magnificent places and wildlife, advance clean energy, and combat climate change. In 2023, alone, our 200 lawyers—alongside policy experts, scientists, and analysts—represented 570 public-interest clients across the country in their fight for justice.

We are cautiously optimistic that direct lithium extraction (DLE) facilities in the Imperial Valley could produce badly-needed transition minerals in less damaging ways than traditional approaches, and in ways that support economic development in the region. At the same time, we need to safeguard local environmental justice communities through appropriate environmental, health, and cultural resource protections, along with guarantees that they will receive social and economic benefits from new industries that arrive in their backyards.

Most of the Imperial Valley communities surrounding the Salton Sea are "disproportionately burdened by multiple sources of pollution," according to the California Environmental Protection Agency's CalEnviroScreen mapping tool, with Imperial County falling within "the bottom 2 percent of healthy community conditions statewide."[1] A main transportation corridor for the activities proposed in the Specific Plan will run through the towns of Niland, Calipatria, and Brawley.[2] The census tracts in these communities have high overall scores on CalEnviroScreen,

[1] Lithium Valley Commission, *Report of the Blue Ribbon Commission on Lithium Extraction in California: Pursuant to Assembly Bill 1657 (E. Garcia, Chapter 271, Statutes of 2020)* at 16 (Dec. 1, 2022), https://efiling.energy.ca.gov/GetDocument.aspx?tn=247861&DocumentContentId=82166.
[2] Dudek, *Initial Study: Imperial County Lithium Valley Specific Plan* at 2, 73 (Dec. 2023) (hereafter Initial Study), https://lithiumvalley.imperialcounty.org/wp-content/uploads/2023/12/Initial-Study-Checklist-LithiumValley-2.pdf.

including scores of up to 98 out of 100 for poverty, 98 for asthma, 100 for impaired waters, and 98 for population characteristics.[3] The Imperial Valley population is predominantly Hispanic.

Niland, Calipatria, Brawley, and other nearby communities suffer from poor baseline air quality, in part due to the mobilization of dust as the Salton Sea continues to shrink—dust that is contaminated with arsenic, selenium, and pesticide runoff.[4] Imperial County has "more than double the state's general rate of asthma-related emergency room visits and hospitalizations for children."[5] The asthma rate at Grace Smith Elementary school in Niland is "nearly double the national average."[6] In addition, the existing geothermal power industry has likely contributed to poor air quality, via emissions of noncondensable gases such as hydrogen sulfide.[7]

Industrial waste and soil contamination are also concerns in Imperial Valley, as some of the area's geothermal power plants have a history of spills of arsenic- and lead-containing waste associated with pipe corrosion from superheated, caustic brine and periodic cleanout of scale buildup.[8] In particular, a 2007 consent agreement involving several facilities resulted in a $910,000 penalty[9] and the ultimate disposal of 8,000 cubic yards of contaminated soil as non-hazardous and 340 cubic yards as hazardous waste.[10]

Imperial County residents also struggle with poor water quality. The canal water managed by the Imperial Irrigation District (IID),[11] which comes from the Colorado River, is so contaminated

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[3] California Office of Environmental Health Hazard Assessment, *CalEnviroScreen 4.0* (2023), https://experience.arcgis.com/experience/11d2f52282a54ceebcac7428e6184203/page/CalEnviroScreen-4_0/.

[4] Emma Newburger, *Ghost towns and toxic fumes: How an idyllic California lake became a disaster*, CNBC, Nov. 6, 2021, https://www.cnbc.com/2021/11/06/californias-salton-sea-spewing-toxic-fumes-creating-ghost-towns-.html#:~:text=Investing%20Club-,Ghost%20towns%20and%20toxic%20fumes%3A%20How%20an,California%20lake%20became%20a%20disaster&text=The%20Salton%20Sea's%20increasing%20salinity,has%20been%20shrinking%20for%20decades; California Department of Pesticide Regulation, *Counties Ranked by Pounds of Chemicals: 2020 and 2021 Comparison* at 1 (undated) (indicating that Imperial County applied roughly five million pounds of pesticides in 2021), https://www.cdpr.ca.gov/docs/pur/pur21rep/counties_ranked_by_pounds_applied_2020_and_2021_comparison.pdf; U.S. Environmental Protection Agency, *Current Nonattainment Counties for All Criteria Pollutants* (updated Dec. 31, 2023), https://www3.epa.gov/airquality/greenbook/ancl.html.

[5] CalEPA, *Environmental Justice Task Force, Imperial County Initiative Report* at 3 (2019), https://calepa.ca.gov/wp-content/uploads/sites/6/2019/10/Imperial_County_EJ_Initiative.a.sw_.hp_.pdf.

[6] *Id.* at 7.

[7] Aras Karapekmez & Ibrahim Dincer, *Modelling of hydrogen production from hydrogen sulfide in geothermal power plants*, 43 International Journal of Hydrogen Energy 10569, 10569 (2018), https://www.researchgate.net/publication/323691024_Modelling_of_hydrogen_production_from_hydrogen_sulfide_in_geothermal_power_plants.

[8] Iris Environmental, *Removal Action Workplan Implementation Report: CalEnergy Geothermal Facilities, Calipatria, California* at 1-2 (2011).

[9] *DTSC Reaches Settlement with Geothermal Company*, 20 No. 22 Cal. Env't Insider 13 (2007); *CalEnergy Operating Corp.*, SRPD GIC851471 (Dep't of Toxic Substances Control Mar. 7, 2007) (corrective action consent agreement).

[10] *See* Iris Environmental, *supra*, at 19-27 (detailing the quantities of contaminated soil removed from several facilities on a site-by-site basis).

[11] IID manages "1,400 miles of lateral canals, 150 miles of main canals [East Highline, Central Main, and Westside Main] and the 80-mile-long All-American Canal" to supply water throughout the Imperial Valley, along with 1,450

that a Compliance Agreement bars the District from providing it to residents for drinking or cooking purposes.[12] State and federal agencies recommend against use of this water source for other domestic purposes,[13] forcing residents to pay approved private providers for safe water sourced from outside the county[14] or risk using untreated irrigation water.[15]

Against this backdrop, the importance of providing the best possible planning and analysis in the Specific Plan and PEIR cannot be overstated. By establishing land use policies for the next 30 to 50 years,[16] these documents will have serious long-term effects on the lives of Imperial Valley residents and environment surrounding the Salton Sea. The standards set within these documents will serve not only as guidance for future clean energy projects in Imperial Valley but also as a model for the newly emerging DLE industry nationwide. For these reasons, it is critical for the County to get the PEIR right, giving thorough consideration to potential impacts and alternatives after full community engagement.

To help guide stakeholder discussions and document preparation moving forward, we offer the following comments on four issues of concern: (1) the importance of transparency in the public process; (2) the importance of clearly defined land use designations that will further the goals of the Specific Plan; (3) the need for difficult discussions and innovative conservation proposals related to Colorado River water supply (which is interrelated to air quality and biodiversity); and (4) the need for clarity in the PEIR regarding tiered CEQA review.

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miles of drainage ditches. IID, *Water Transportation System* (2024), https://www.iid.com/water/water-transportation-system#:~:text=Three%20main%20canals%2C%20East%20Highline,canals%20throughout%20the%20Imperial%20Valley.

[12] IID, *Drinking Water Compliance Program* (Jan. 16, 2024), https://www.iid.com/home/showpublisheddocument/9887/638409996587430000; Letter from Steve Charlton, IID Senior Program Manager, Water Quality Programs, to Sean Sterchi, San Diego/Imperial Dist. Eng'r, State Water Res. Control Bd. (Mar. 23, 2021), https://www.iid.com/home/showpublisheddocument/19810/637774109431700000, citing Letter from Dep't of Health Servs. Drinking Water Field Operations Branch, to Jesse P. Silva, Gen. Manager, IID (May 16, 2000), https://www.iid.com/home/showpublisheddocument/293/635648001335730000.

[13] IID, *Drinking Water Compliance Program*, *supra*.

[14] *See, e.g.,* D & M Water Supply Corp., *2022 Consumer Confidence Report for Public Water System D & M WSC* at 2 (2023) (listing water sources for an IID-approved provider as the Carrizo-Wilcox aquifer and Nacogdoches Lake/Reservoir), https://dmwater.org/documents/305/CCR_to_post_to_website_06062023.pdf.

[15] Tara Lohan, *Toxic Taps: Why It's Legal to Pump Untreated Canal Water Into Californians' Homes,* Sept. 14, 2017, https://deeply.thenewhumanitarian.org/water/articles/2017/09/14/why-its-legal-to-pump-untreated-canal-water-into-californians-homes.

[16] Land Use Alts. Memorandum from RICK Planning + Design to Jim Minnick, Imperial Cnty. Plan. & Dev. Servs. Dir. at 6 (Oct. 27, 2023) (hereafter LUA Memorandum), https://lithiumvalley.imperialcounty.org/wp-content/uploads/2023/11/Lithium-Valley-Land-Use-Alternatives-Memorandum_102723.pdf.

I. Transparency and Robust Public Engagement Are Crucial to CEQA's Goals.

We encourage equitable and transparent opportunities for public participation and comment on the Specific Plan and PEIR to ensure fully informed decision-making based on input from local communities.[17]

The Legislature enacted CEQA to provide for the long-term protection of health, safety, and the environment, and CEQA cannot accomplish these goals without public involvement.[18] A "paramount consideration" in CEQA review "is the right of the public to be informed in such a way that it can intelligently weigh the environmental consequences of any contemplated action and have an appropriate voice in the formulation of any decision."[19] The public holds a "privileged position" in the CEQA process, "based on a belief that [residents] can make important contributions to environmental protection and on notions of democratic decision-making[.]"[20]

Accordingly, as a general matter, each step of the public engagement process must include sufficient time for review of related materials. All notices must clearly explain the manner in which the County will receive and consider public comments—including that members of the public may submit comments by email or orally at public hearings in addition to written comments. Directions, hearing notices, and environmental review materials should be translated into languages spoken by local populations (including, here, not only Spanish, but also Purépecha, an Indigenous language from the Mexican state of Michoacán, spoken by a significant number of monolingual or functionally monolingual speakers in and near the affected area).[21]

Lead agencies should engage in community outreach well in advance of decision-making deadlines so that members of the public are fully informed of their ability to participate. Agencies should schedule hearings during weeknights or weekends when community members may be more available to attend, at locations accessible to impacted populations, with childcare options and food provided.

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[17] *See* Cal. Code Regs., tit. 14, § 15002(j) (requiring the solicitation and response to public comments under CEQA); *Laupheimer v. State*, 200 Cal. App. 3d 440, 458 (1988) (stating that one of CEQA's goals is to "give[] private citizens and citizens' groups an active role, expressly recognizing citizens' 'responsibility to contribute to the preservation and enhancement of the environment'" (quoting Pub. Res. Code, § 21000(e))).

[18] *See generally* Pub. Res. Code, §§ 21000, 21001. *See also* Cal. Code Regs., tit. 14, § 15201 ("Public participation is an essential part of the CEQA process.").

[19] *Env't Planning & Info. Council v. County of El Dorado*, 131 Cal. App. 3d 350, 354 (1982) (quotation marks omitted); *see also Vineyard Area Citizens for Responsible Growth v. City of Rancho Cordova*, 40 Cal. 4th 412, 449 (2007) (explaining that CEQA's procedures are designed to ensure that government officials who approve projects "do so with a full understanding of the environmental consequences and, equally important, that the public is assured those consequences have been taken into account").

[20] *Concerned Citizens of Costa Mesa v. 32nd Dist. Agric. Ass'n*, 42 Cal. 3d 929, 936 (1986) (quotation marks omitted).

[21] *See* Ann Marie Cheney, et al., *Latinx and Indigenous Mexican Caregivers' Perspectives of the Salton Sea Environment on Children's Asthma, Respiratory Health, and Co-Presenting Health Conditions*, Int'l J. Env't Res. Pub. Health at 4 (2023) (describing "[t]he adult population living along the Salton Sea's border" as "predominantly an immigrant, mono-lingual Spanish-speaking Latinx population born in Mexico that travelled to the region to work in the agricultural fields," along with "one of the largest Purépecha communities in the US"). Translation into Spanish and Purépecha would be consistent with practices established by the Lithium Valley Commission.

With regard to this particular proposal, we appreciate the creation of a Lithium Valley website as a clearinghouse for public information concerning the Specific Plan and PEIR,[22] but there is room for improvement. The website contains a substantial document that post-dates, and is not mentioned in, the Notice of Preparation (NOP)—the 668-page Final Baseline Report (Report), which the Specific Plan and PEIR will "build from," and whose purpose is "to establish an inventory of existing conditions within the Study Area." Rather than mentioning this Report, the NOP merely sought comments on "the scope of the PEIR" while cross-referencing "the associated Initial Study" available on the Lithium Valley website.[23] Additionally, the scoping comment period opened on December 7, 2023 but the Report is dated February 2024 and appears not to have been available until well into the comment period, without any notice to the public of its release. Due to the Report's belated release, along with its omission from the NOP, the public may not have had adequate time or awareness to provide meaningful comments on the Report. Going forward, we encourage the County to re-notice any public comment period after the release of material new information to ensure legal compliance with CEQA and robust public engagement.

Likewise, while the Initial Study references a Land Use Alternatives (LUA) Memorandum presented to the Board of Supervisors on November 7, 2023,[24] this document is not included as an attachment to the Initial Study and is buried on a sub-page of the Lithium Valley website. It would be helpful going forward for the County to include cross-referenced documents as attachments within a single file or links from the same Lithium Valley landing page.[25]

The Initial Study characterizes its Proposed Land Use Alternative as a "revised version" of Alternative 2 from the LUA Memorandum, based on public comments.[26] It would be helpful to the public for the County to elaborate on the ways in which Alternative 2 has changed, the feedback the County received on the LUA Memorandum, and any other reasons for the County's switch between the unnumbered Preferred Alternative in the LUA Memorandum (described in that document as a combination of Alternatives 1, 2, and 3) and the newly preferred revised Alternative 2.

Additionally, while we are pleased to see the County considering not just one, but five, alternatives to date,[27] the LUA Memorandum's identification of a preferred alternative and the Initial Study's selection of a modified proposed alternative at the scoping stage is confusing, as it suggests the County has predecided one of the ultimate questions that should not be resolved until the end of the CEQA process. As we are only at the very beginning of this process, we

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[22] *See generally* Imperial County, *Lithium Valley* (2021), https://lithiumvalley.imperialcounty.org/.
[23] Imperial Cnty. Plan. & Dev't Servs. Dep't, *Notice of Preparation of Draft Program EIR for the Lithium Valley Specific Plan [and] Notice of Public Scoping Meeting* at 1-2 (updated Dec. 21, 2023) (hereafter Notice of Preparation), https://lithiumvalley.imperialcounty.org/wp-content/uploads/2023/12/Lithium-Valley-NOP-12-21.pdf.
[24] Initial Study, *supra*, at 2.
[25] *See* Pub. Res. Code, § 21003(b) (explaining that CEQA documents must "be organized and written in a manner that will be meaningful and useful to decisionmakers and to the public").
[26] Initial Study, *supra*, at 2.
[27] The alternatives analysis is "the core of an EIR." *Citizens of Goleta Valley v. Bd. of Supervisors*, 52 Cal. 3d 553, 564 (1990). Accordingly, "alternatives and the reasons they were rejected . . . must be discussed in the EIR in sufficient detail to enable meaningful participation and criticism by the public." *Laurel Heights Improvement Ass'n v. Regents of Univ. of Cal.*, 47 Cal. 3d 376, 405 (1988), *as modified on denial of reh'g* (Jan. 26, 1989).

encourage decision-makers to maintain an open mind—as CEQA requires[28]—and listen to all public comments at the scoping and draft-PEIR stages prior to finalizing the land use designations in the Specific Plan and ruling out any alternatives.

We also encourage the County not to presume baseline knowledge at public hearings. During the scoping hearing on December 14, 2023, the presenter began in the middle, rather than the beginning, by suggesting that everyone already knew all about the proposed Specific Plan due to prior community outreach, and then jumping to public comments almost immediately. This choice to shortcut a real presentation of the Specific Plan at the outset of scoping was not the right choice, since the point of the scoping meeting for an EIR is to provide all the relevant information to launch the official EIR process. The presentation was surely confusing for anyone who had not been part of any task force or advisory group, and contributes to the sense that the County may view this project as much further along in the process than appropriate at this early phase in scoping, at a point when there has not yet been any of the formal analysis or public input required under CEQA. To facilitate meaningful public participation moving forward, it will be important for the County to include an overview of the proposal at each public hearing. It is likely that news of the Specific Plan and PEIR will spread over time to attract community members lacking prior engagement or background knowledge.

Further, there are discrepancies and omissions between documents from the County posted to the CEQAnet website and the NOP that may make it confusing for members of the public to know where to submit their comments. While CEQA requires agencies to accept comments on draft environmental documents via email,[29] the NOP lists only a mailing address and asks members of the public to mail their comments to the attention of Jim Minnick. By contrast, CEQAnet lists Diana Robinson as the CEQA contact (presumably based on information contained in a letter from the County to the State Clearinghouse maintained by the Office of Planning and Research[30]), and contains both a mailing address and email address. Going forward, the County should maintain consistency throughout agency communications and public notices regarding project contacts and should be sure to include an email address on all requests for public comment.

We look forward to the opportunity to engage thoroughly with the draft Specific Plan and draft PEIR, through a substantial public comment period that allows adequate time and opportunities for meaningful public review and includes the timely release and organized presentation of all associated materials.

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[28] *See City of Rancho Cordova*, 40 Cal. 4th at 449-50 ("[T]he public must be given an adequate opportunity to comment . . . before the decision to go forward is made.").
[29] Pub. Res. Code, § 21091(d)(3)(A).
[30] *See* Letter from Jim Minnick, Director, Imperial Cnty. Plan. & Dev't Servs., to Cal. Office of Plan. & Research – State Clearinghouse (Dec. 21, 2023) (stating that, "should you have any questions please contact Diana Robinson at dianarobinson@co.imperial.ca.us"), https://files.ceqanet.opr.ca.gov/293418-1/attachment/6TRqGvKg4FEx2dHNP76frzdOyAfJxnEWAz6UzaF14olaV5B-riW6Das-NYho5m42bVJ6nD7l3CLCUxaz0. A Notice of Completion further lists the project contacts as "Diana Robinson/Jim Minnick," https://files.ceqanet.opr.ca.gov/293418-1/attachment/kcZwFjsO-4bJeVWEFTpVPAF9okAkp0FbA6-MVNcp8XfG3A8b2X0jHANQ57V_5bhUW51X8EDFxOmFFBOM0.

II. The Land Use Designations in the Specific Plan Should Encourage a Circular Economy and Zero-Emissions Uses and Reject False Solutions.

We appreciate the Specific Plan's focus on renewable energy, and we recommend additional clarification of the proposed land use designations to ensure that they meet the County's decarbonization goals, are not co-opted by outside interests promoting false solutions, and adequately protect communities from the risk of overdevelopment within the large Project Planning Area (51,786 acres total, including 10,000 acres in the near-term).[31] We also look forward to incorporation of the land use designations into the project description of the PEIR for ease of reference and public understanding (they are not discussed in the body of the Initial Study but only in Figure 3 at the end of the document).[32]

As currently proposed, the Specific Plan would broadly allow commercial and industrial uses "associated" with renewable energy development and lithium extraction,[33] including facilities for "manufacturing and distribution of related products (electric batteries, capacitors, vehicles, components etc.)" and "other innovative renewable resources industries."[34] The Green Industrial zone would "allow for additional industrial uses that support the goal of decarbonizing the energy industry." We are concerned with the breadth of potential industrial uses that could fall within the current proposal. In particular, we have seen many false solutions proposed under the ostensible goal of decarbonization. We encourage careful tailoring of each land use designation to ensure that the actual uses meet the Specific Plan's goals.

First, as the County presents its vision for Lithium Valley, we encourage additional focus on a circular economy. We must seek to meet the demand for transition minerals in the most sustainable way possible: by reducing, reusing, and recycling, and by extending the life of materials and products we already have. Demand reduction and circular economy policies should take priority over new extraction, and the Specific Plan and the PEIR's analysis should reflect these values.

Second, we appreciate the specification in the Green Industrial land use designation that only "green hydrogen" should be allowed,[35] as distinguished from hydrogen produced from polluting sources like fossil fuels or gas from factory farms,[36] but we are concerned at the lack of clear and appropriate limitations or guidelines that would cabin both the allowable production methods and end-uses of green hydrogen. For example, the Baseline Report includes biomass in the definition of green hydrogen, based in part on the assumption that it "can be produced through organic

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[31] Initial Study, *supra*, at 2, 8.
[32] *Compare id.* at 8 (project description) *with id.* at 73, 75 (Figures 2-3). *See also Inyo v. City of Los Angeles*, 71 Cal. App. 3d 185, 193 ("An accurate, stable and finite project description is the *sine qua non* of an informative and legally sufficient EIR.")
[33] Initial Study, *supra*, at 2, 5, 8.
[34] *Id.* at 8.
[35] *Id.* at 75 (Figure 3).
[36] Earthjustice, *Reclaiming Hydrogen for a Renewable Future: Distinguishing Oil & Gas Industry Spin from Zero-Emission Solutions*, Aug. 31, 2021, https://earthjustice.org/feature/green-hydrogen-renewable-zero-emission; Sasan Saadat and Sara Gersen, *Reclaiming Hydrogen for a Renewable Future: Distinguishing Oil & Gas Industry Spin from Zero-Emission Solutions*, Earthjustice at 3 (2021), https://s3.documentcloud.org/documents/21063573/reclaiming-hydrogen-for-a-renewable-future.pdf.

wastes,"[37] but the economic reality is that waste streams alone do not provide cost-effective and logistically manageable biomass feedstocks without energy crops grown specifically for biofuel production (see below).[38] Accordingly, we caution the County to beware of false solutions when it comes to hydrogen production and use, and, at a minimum, to acknowledge and adhere to widely-recognized principles for adoption and use of clean hydrogen technology,[39] while ensuring adequate mitigation of negative impacts in the PEIR.

Relatedly, we caution that buildout of biofuels production within the Green Industrial land use designation[40] could lead to harm by diverting the productive capacity of land from other uses. Production of biofuels (especially via corn and soy) often leads to the conversion of uncultivated lands to farmlands, thereby releasing previously stored carbon, destroying native habitat, impacting biodiversity, diverting additional water supply, and contributing to fertilizer and pesticide runoff.[41] All of these things would exacerbate existing problems in and around the Salton Sea, illustrating that including biofuels would, at a minimum, require significant mitigation in the PEIR, as well as future project-specific environmental analysis.

In light of the potential challenges with green hydrogen and biomass, we encourage the County to consider an alternative formulation of the Green Industrial land use designation that would exclude both of these categories entirely. The LUA Memorandum notes that the County received comments in favor of "eliminating uses such as Biofuels and Green Hydrogen" at a preliminary workshop but concluded that doing so "would limit the vision of the overall planning effort and branding of the area as a center for renewable energy."[42] As discussed in Section I, above, a decision by the County to rule out any alternatives is premature at this early juncture, and we hope the County will fully study this option as part of the CEQA process before committing to a path forward.

Third, we encourage incorporation of clean technologies, zero emissions, and decarbonized fleets into the Manufacturing and Logistics land use designations. These uses would create "industrial

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[37] Final Baseline Report, *supra*, at 97.
[38] Saadat, *supra*, at 14.
[39] *See, e.g.,* Rachel Fakhry, *New Analysis: The 3 Pillars Will Support Large Hydrogen Deployment,* NRDC, June 20, 2023 (discussing the Three Pillars of clean hydrogen—"1) new clean supply, 2) hourly matching and 3) deliverability"), https://www.nrdc.org/bio/rachel-fakhry/new-analysis-3-pillars-will-support-large-hydrogen-deployment, citing Ben Haley & Jeremy Hargreaves, *45V Hydrogen Production Tax Credits: Three-Pillars Accounting Impact Analysis*, Evolved Energy Research (2023), https://www.evolved.energy/post/45v-three-pillars-impact-analysis. *See also* Letter from Black Labor Week Project Inc., et al., to Dr. Dorothy Davidson, Chief Executive Officer/President, Midwest Alliance for Clean Hydrogen (MachH2) (Feb. 6, 2024), https://energynews.us/wp-content/uploads/2024/02/Midwest-Advocates-Letter-to-MachH2-February-2024.pdf.
[40] Initial Study, *supra*, at 75 (Figure 3); Final Baseline Report at 101.
[41] Carrier Apfel and Matt Ellis-Ramirez, *Biofuels: Why Growing Food for Fuel is a Foolish Choice*, Earthjustice, April 15, 2022, https://earthjustice.org/experts/carrie-apfel/biofuels-why-growing-food-for-fuel-is-a-foolish-choice; Peter Fairley, *The New Era of Biofuels Raises Environmental Concerns*, Scientific American, Dec. 13, 2022, https://www.scientificamerican.com/article/the-new-era-of-biofuels-raises-environmental-concerns/. *See also* Letter from Alison Cullen, Chair, Science Advisory Bd., to Michael Regan, Adm'r, U.S. Env't Prot. Agency (Sept. 29, 2023), https://sab.epa.gov/ords/sab/f?p=114:0:13825674004064:APPLICATION_PROCESS=REPORT_DOC:::REPORT_ID:1120 (explaining that the transition to biofuels produced from food crops has not been a successful method of decarbonizing the transportation sector).
[42] LUA Memorandum at 14.

transportation hubs," with a main transportation corridor running through Niland, Calipatria, and Brawley.[43] Warehousing and distribution can be huge sources of air pollution (including particulate matter 2.5 and nitrogen oxides),[44] which is already an issue in these disadvantaged communities. Mitigation measures such as battery-electric Class 7 and 8 semi-trucks to efficiently carry cargo would significantly reduce the amount of GHG emissions associated with these uses.[45] At a minimum, the PEIR should incorporate the California Attorney General's best practices and mitigation measures for CEQA compliance.[46]

Fourth, to the extent the Green Industrial designation allows for "minerals recovery," we want to ensure that the Specific Plan contemplates only methods anticipated to have lower impacts, such as DLE, but would not allow for the creation of new traditional mines. (For example, the Baseline Report notes that there is a preexisting gypsum-anhydrite mine in the Study Area, along with a potassium and salt mine).[47]

Finally, we appreciate the County's consideration of the Playas Renewables, Playas Restoration, Conservation, and Floodway designated uses, which would facilitate

(a) dedicating a percentage of land "for dust suppression via natural vegetation and restoration techniques, beyond what is required to mitigated onsite surface impacts";
(b) "above-surface environmental restoration activities";
(c) "conserved and/or restored critical habitat, Salton Sea rehabilitation projects, and mitigation lands"; and
(d) permanent open space and riparian buffers on either side of the Alamo and New Rivers.

At the same time, conservation should not be limited to "areas under existing contract by the [IID] for restoration and mitigation efforts,"[48] as significant additional lands will be needed for mitigation in light of the grand scale of the Specific Plan proposal.

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[43] Initial Study, *supra*, at 73, 75 (Figures 2-3).
[44] *See* American Cancer Society, *Diesel Exhaust and Cancer Risk* (last revised July 27, 2015), https://www.cancer.org/cancer/risk-prevention/chemicals/diesel-exhaust-and-cancer.html#:~:text=The%20EPA%20classifies%20diesel%20exhaust,a%20%E2%80%9Cpotential%20occupational%20carcinogen.%E2%80%9D; California Office of Environmental Health Hazard Assessment, *Health Effects of Diesel Exhaust* (May 21, 2001), https://oehha.ca.gov/media/downloads/calenviroscreen/indicators/diesel4-02.pdf.
[45] *See generally* Union of Concerned Scientists, *Ready for Work: Now is the Time for Heavy Duty Electric Vehicles* (2019), https://www.ucsusa.org/sites/default/files/2019-12/ReadyforWorkFullReport.pdf; Amol Phadke, et al., *Why Regional and Long-Haul Trucks are Primed for Electrification Now*, Lawrence Berkeley National Lab, International Energy Analysis Department (2021), https://eta-publications.lbl.gov/sites/default/files/updated_5_final_ehdv_report_033121.pdf; Goldman School of Public Policy, *2035 The Report Appendices- Transportation: Plummeting Costs and Dramatic Improvements in Batteries can Accelerate Our Clean Transportation Future*, University of California, Berkeley (2021), http://www.2035report.com/transportation/wp-content/uploads/2020/05/GridLab_2035-Transportation-Appendix.pdf?hsCtaTracking=c4d392a4-96ff-474c-86c3-bfa335c67aa2%7Ce2107ae8-40d7-44ff-8b5b-72016d87fe98.
[46] *See generally* State of California, Department of Justice, *Warehouse Projects: Best Practices and Mitigation Measures to Comply with the California Environmental Quality Act* (updated Sept. 2022) (discussing various considerations including siting and design, air quality and greenhouse gases, noise impacts, and traffic impacts), https://oag.ca.gov/system/files/media/warehouse-best-practices.pdf.
[47] Final Baseline Report, *supra*, at 314.
[48] Initial Study, *supra*, at 75 (Figure 3).

We appreciate the thought the County has already put into proposed land use designations to-date, and we look forward to seeing a project description in the draft PEIR that incorporates those categories that will truly advance clean energy and decarbonization goals while containing a sufficiently focused scope to enable full and proper consideration of environmental impacts, alternatives, and mitigation measures.[49]

III. The Specific Plan and PEIR Must Embrace Difficult Conversations about Colorado River Water Supply and Explore Innovative Conservation Proposals.

Now is the time to take an honest look at complex questions regarding Colorado River water supply,[50] as the Specific Plan calls for large amounts of water in a region where water is so scarce and polluted that residents must obtain it from outside sources. Creative and concrete proposals to curtail existing water usage and free up additional supply will be necessary before the Specific Plan can become a reality. Otherwise, water-related impacts could exacerbate the shrinkage of the Salton Sea, which in turn would have significant implications for other impact categories such as air quality and biodiversity.

The Salton Sea is California's largest inland lake.[51] It was created as a byproduct of a floodwater breach in 1905 from an irrigation canal that connected the Imperial Valley to the Colorado River.[52] Since then, the Sea has been maintained by irrigation runoff in the Imperial and Coachella valleys and local rivers.[53] The Sea overlaps with the ancient Lake Cahuilla, which is culturally significant as the ancestral homeland of the Cahuilla, Quechan, Kumeyaay, Cocopah, and other Indigenous Peoples.[54]

The Salton Sea serves as an important stopover for migratory birds along the Pacific Flyway.[55] According to California's Department of Fish & Wildlife, "the Salton Sea … supports some of the highest levels of avian biodiversity in the southwestern United States" with "[m]ore than 400 resident, migratory, and special status bird species [being] recorded in the Salton Sea area since its formation, with about 270 of those species using the Salton Sea on a fairly regular basis,"[56] including the endangered Yuma Clapper Rail and California Black Rail. In addition to providing habitat, the Sea's fish populations serve an important food source for migratory birds.[57] The Sea is protected as a National Wildlife Refuge.

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[49] *See County of Inyo*, 71 Cal. App. 3d at 199 (holding that an "accurate, stable and finite project description is the *sine qua non* of an informative and legally sufficient EIR").
[50] *See* Cal. Code Regs., tit. 14, § 15004(b) (explaining that CEQA review should occur "as early as feasible in the planning process to enable environmental considerations to influence project program and design").
[51] Mac Taylor, *Salton Sea: A Status Update*, Legislative Analyst's Office at 3 (2018), https://lao.ca.gov/reports/2018/3879/salton-sea-082918.pdf.
[52] Cal. Dept. of Fish & Wildlife, *Background Information on the Salton Sea* (undated). https://wildlife.ca.gov/Regions/6/Salton-Sea-Program/Background.
[53] *Id.*
[54] David Arevalo, *Land of Extremes: Tule, trails, and trade: Kumeyaay prosperity*, Imperial Valley Press, Feb. 16, 2024, https://www.ivpressonline.com/life/desertmuseum/land-of-extremes-tule-trails-and-trade-kumeyaay-prosperity/article_aaa996dc-cb9a-11ee-a9fd-fff6d43b0833.html.
[55] Matt Dokas, *What You Should Know About the Pacific Flyway*, Peninsula Open Space Trust, Dec. 11, 2017, https://openspacetrust.org/blog/pacific-flyway/.
[56] Cal. Dept. of Fish & Wildlife, *supra*.
[57] *Id.*

For many years, the Sea has struggled with drought, increased salinity, reduced water quality, and overall shrinkage, along with reduced survivability of native, threatened/endangered, and migratory species.[58]

As there is only a limited, and shrinking, supply of Colorado River water to draw from, a future where "Lithium Valley" becomes a reality will be one that necessarily curtails farming in Imperial County. The Salton Sea depends on surface water runoff from agricultural fields for replenishment, meaning that a shift from agriculture to renewable energy uses will almost certainly tend to further shrink the Sea's area, exacerbating dust problems related to exposed playa and contributing to a biodiversity crisis. This reality means that it is especially important to get the environmental review right, fully analyzing and requiring appropriate mitigation of water-related project impacts.

Imperial County is already the single largest user of the over-allocated Colorado River.[59] Imperial County "consum[ed] more water than all of Arizona and Nevada combined in 2022."[60] Most of that water went to farming, as Imperial County "produces two-thirds of the vegetables consumed in the U.S. during winter months."[61] Accordingly, when cuts to California's water allotment were necessary last year, those cuts fell primarily on Imperial County.[62] The 2023 agreement represented only a temporary first step in managing an ongoing drought crisis. Further cuts are necessary and will become increasingly urgent in the future.

We appreciate the Baseline Report's recognition that "[g]eothermal and lithium recovery operations can have intensive water demands, compared to other energy sources (both renewable and non-renewable)," and "the data remains uncertain on what the true water demand may be for future geothermal and lithium recovery operations," underscoring the need for "[a]dditional collaboration with agencies and operators."[63] Likewise, we appreciate the Report's frank acknowledgment of "water management challenges for the District."[64] These challenges include "limitations on water storage because of the flat terrain, limitations on reuse opportunities because of the salinity of Colorado River, existing deterioration of Salton Sea including exposed playa and increased salinity, and poor water quality of underlying groundwater resources,"[65] in combination with the concern that "changes in surface water runoff and drainage patterns can affect the local hydrology including discharges to the Salton Sea."[66]

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[58] Newburger, *supra*.
[59] Alex Hager, *The Colorado River's biggest user will conserve some water in exchange for federal dollars*, KUNC, Dec. 5, 2023, https://www.kunc.org/news/2023-12-05/the-colorado-rivers-biggest-user-will-conserve-some-water-in-exchange-for-federal-dollars.
[60] Alastair Bland, *Growers brace to give up some Colorado River water*, CalMatters, Jan. 17, 2023, https://calmatters.org/environment/2023/01/colorado-river-water/.
[61] *Id.*
[62] Rachel Becker, *Western States' planned water cuts are enough to avert a Colorado River crisis, for now*, CalMatters, Oct. 25, 2023, https://calmatters.org/environment/water/2023/10/colorado-river-california-water-cuts/.
[63] Final Baseline Report, *supra*, at 108.
[64] *Id.* at 308.
[65] *Id.*
[66] Initial Study, *supra*, at 34.

The Initial Study and Baseline Report contain the following broad suggestions related to water supply:

- "water storage and banking opportunities, conservation measures, exchanges and transfer programs, and capital improvements";[67]
- "[i]ncorporating recycled water as a means of augmenting the water supply";[68]
- enhancing water management efforts;[69]
- "new treatment facilities . . . for water recycling on-site to supplement the available water sources";[70] and
- "removing existing agricultural demands that currently exist within the Plan area."[71]

While these general topics provide a good starting point for discussion, the Specific Plan and PEIR will require specific, and detailed proposals to address water demand and mitigate related impacts.

The proposed Specific Plan will put additional stress on the drought-ravaged Colorado River system. The LUA Memorandum anticipates Phase 1 water consumption of 123,917 acre-feet per year (AFY) for Alternative 2 (the alternative used as the basis for the proposal in the Initial Study). One acre-foot "is about the amount of water it would take to flood a football field (roughly one acre in size) one foot deep," and a typical California household uses only one-half to one acre-foot of water each year, with water-intensive farming, such as growing one acre of alfalfa in Imperial Valley, using closer to 10 acre-feet of water annually.[72]

To put the roughly-124,000 AFY figure in perspective, IID's available Colorado River supply for new non-agricultural projects was only 22,800 AFY as of December 2021.[73] The County needs an updated figure to use in the PEIR, as an IID figure from February 2023 stated that only 19,620 AFY were actually available.[74] Using this more recent figure, the combined water demand of lithium and geothermal projects already on the books completely exhausts the IID's reserved water supply.[75]

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[67] Final Baseline Report, *supra*, at 308.
[68] Initial Study, *supra*, at 33-34.
[69] *Id*. at 34.
[70] *Id.* at 48.
[71] Final Baseline Report, *supra*, at 309.
[72] Earthworks and Comite Civico del Valle, *Environmental Justice In California's Lithium Valley* at 25 (2023), https://earthworks.org/wp-content/uploads/2023/10/California-Lithium-Valley-Report.pdf.
[73] Initial Study, *supra*, at 48.
[74] IID, *Municipal, Industrial and Commercial Customers* (last updated Feb. 1, 2023), https://www.iid.com/water/municipal-industrial-and-commercial-customers.
[75] Compare, for example, BHE Renewables' Black Rock, Elmore North, and Morton Bay proposed geothermal power plants, which would use a combined 13,165 AFR, and Controlled Thermal Resource's recently approved Hell's Kitchen project, which has an estimated water demand of 6,500 AFY. BHE Renewables, *Black Rock, Elmore North and Morton Bay Geothermal Projects California Energy Commission Informational Hearing* at 6 (Aug. 31, 2023), https://efiling.energy.ca.gov/GetDocument.aspx?tn=252010&DocumentContentId=87007; Delfino Matus & Richard Montenegro Brown, *Hell's Kitchen Lithium Extraction Project Gets Green Light*, Calexico Chronicle, Dec. 15, 2023, https://calexicochronicle.com/2023/12/15/hells-kitchen-lithium-extraction-project-gets-green-light/.

Accordingly, the Initial Study's conclusion that "IID, as a senior Colorado River water rights holder, expects to have sufficient water supplies for its customers in perpetuity"[76] is at odds with both the Baseline Report and on-the-ground realities for the region, which will require additional local, state, and federal conservation projects to make that statement true. There is nevertheless room for optimism, in light of projects and funding targeted toward improving Colorado River water supply for all users reliant on this source, both downstream and upstream.

To thoroughly explore both the water shortage problem and innovative mitigation solutions, we support creation of a Water Supply Assessment as called for in the Baseline Report.[77] Due to the complexity of the water supply issue, the County should convene a Water Supply Task Force to draft the Assessment, and the task force should be comprised of independent subject-matter experts with no financial ties to the geothermal or lithium industries or other conflicts of interest. A Water Supply Task Force would be similar to the Infrastructure Technical Advisory Group, Land Use and Development Technical Advisory Group, Environmental Justice Working Group, and Academic Task Force already convened to provide input into the Specific Plan process.[78]

The Water Supply Assessment should include a detailed, up-to-date inventory of known Colorado River conservation projects and funding that could directly affect available water supply for the Specific Plan, along with projects that could serve as an inspiration for mitigation measures (similar to the way the Baseline Report and LUA Memorandum list examples of providers of low-carbon energy resources in Imperial Valley and other example projects that would fit each of the proposed designated uses[79]).

For example, IID and the Bureau of Reclamation reached an agreement to conserve 100,000 acre feet of water in 2023, based in part on $77.6 million in Investing in America funding, with an anticipated follow-up agreement to conserve 800,000 acre feet between 2024 and 2026.[80] Likewise, the Agreement should explore the implications of any relevant water infrastructure projects funded by $8.3 billion in Bipartisan Infrastructure Law monies, including "$300 million to implement the Colorado River Basin Drought Contingency Plan, designed to protect the Colorado River system through voluntary reductions and increased conservation."[81] Further, the Inflation Reduction Act designated $250 million for the specific purpose of "mitigat[ing] impacts from the worsening drought crisis impacting the Salton Sea in Southern California," in combination with $583 million in related state funding.[82] Likewise, SB 125 allocates 20% of

[76] Initial Study, *supra*, at 48.
[77] Final Baseline Report, *supra*, at 112.
[78] LUA Memorandum, *supra*, at 10.
[79] *See, e.g.,* Final Baseline Report at 85-107 (section 7.1); LUA Memorandum at 15-27.
[80] U.S. Dep't of the Interior, *Biden-Harris Administration Announces New Agreement with Imperial Irrigation District to Save 100,000 Acre-Feet of Water in Colorado River System*, Dec. 4, 2023, https://www.doi.gov/pressreleases/biden-harris-administration-announces-new-agreement-imperial-irrigation-district-save; Imperial Irrigation District, *IID Backs Conservation Plan, Strengthening Colorado River and Salton Sea*, Dec. 1, 2023, https://www.iid.com/Home/Components/News/News/1146/793.
[81] U.S. Dep't of the Interior, *Addressing Drought* (undated), https://www.doi.gov/priorities/investing-americas-infrastructure/addressing-drought.
[82] U.S. Dep't of the Interior, *Inflation Reduction Act Funds Landmark Agreements to Accelerate Salton Sea Restoration*, Nov. 28, 2022, https://www.doi.gov/pressreleases/inflation-reduction-act-funds-landmark-agreements-accelerate-salton-sea-restoration; Alex Padilla, U.S. Senator for California, *Padilla Announces $367 Million in*

lithium tax dollars to a Salton Sea Restoration Fund.[83] The Water Supply Assessment should discuss all of these agreements and funding sources in determining a viable path forward to supplying water for the Specific Plan while mitigating impacts. Additionally, the Assessment should make the full text of all agreements and funding mechanisms available as attachments to that document for public review.

Separate from the potential of outside funding to help mitigate water supply issues, the PEIR should explore creative mitigation that internalizes the costs of development, such as requiring the industries who will benefit from Lithium Valley to contribute back to directly affected communities in a fee scheme proportionate to the amount of water they use, which could incentivize efficiency.

We are hopeful that if the County does the hard work throughout this CEQA process of addressing water supply head-on, the final PEIR (in conjunction with tiered EIRs that may be required for specific projects) will ultimately contain adequate mitigation measures to create a sustainable Lithium Valley.[84]

IV. We Support the Use of Tiered CEQA Review on a Project-by-Project Basis.

It is likely that individual Lithium Valley projects will require tiered CEQA review on top of the PEIR, due to the breadth of the proposed Specific Plan and the difficulty of fully identifying and analyzing all potential impacts at the program level over the project's 30-to-50 year lifetime and beyond.[85] While this is true for all impacts, it is especially true here for impacts related to water supply.

CEQA allows the use of a "program" EIR "on a series of actions that can be characterized as one large project."[86] Even so, "[l]ater activities in the program must be examined in the light of the program EIR to determine whether an additional environmental document must be prepared," and in many cases the agency will have to perform additional site-specific environmental review.[87] In such a case, the agency will need to develop a "tiered" EIR for specific projects which post-date the PEIR.[88] "Tiering" refers to the "coverage of general matters in broader EIRs . . . with subsequent narrower EIRs or ultimately site-specific EIRs incorporating by

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Funding for Colorado River Conservation Agreements and Salton Sea Restoration, Dec. 13, 2023, https://www.padilla.senate.gov/newsroom/press-releases/padilla-announces-367-million-in-funding-for-colorado-river-conservation-agreements-and-salton-sea-restoration/.

[83] S.B. 125, § 6, 2021 Leg., Reg. Sess. (Cal. 2022) (enacting Revenue & Tax'n Code, § 47100(b)), https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220SB125.

[84] *See Sutter Sensible Plan., Inc. v. Bd. of Supervisors of Sutter Cnty.*, 122 Cal. App. 3d 813, 820-22 (1981) (explaining the importance under CEQA of preventing "stubborn problems . . . from being swept under the rug").

[85] LUA Memorandum at 6.

[86] Cal. Code Regs., tit. 14, § 15168(a).

[87] Cal. Code Regs., tit. 14, § 15168(c); *see Ctr. for Sierra Nevada Conservation v. County of El Dorado*, 202 Cal. App. 4th 1156, 1171 (2012) ("[A] program EIR does not always suffice for a later project. Sometimes a 'tiered' EIR is required." (quotation marks omitted)); *Friends of Mammoth v. Town of Mammoth Lakes Redevelopment Agency*, 82 Cal. App. 4th 511, 533-34 (2000) ("Designating an EIR as a program EIR also does not by itself decrease the level of analysis otherwise required in the EIR.").

[88] Pub. Res. Code, § 21094(a).

reference the general discussions and concentrating solely on the issues specific to the EIR subsequently prepared."[89]

Water supply issues are particularly difficult to address at a broad, programmatic level. For example, the Supreme Court recognized the difficulty of "foresee[ing] with certainty specific sources of water and their impacts" over a 30-year implementation period, given potentially changing conditions over time, "such as changes in population projections, demographics, new or revised environmental restrictions, pollution of sources, or water supply effects from prolonged droughts."[90] The Court upheld the identification of water sources and analysis of associated impacts in "general terms" in a Bay-Delta restoration program PEIR—but only "with the understanding that additional detail will be forthcoming when specific second-tier projects are under consideration."[91] Here, in light of the proposed Specific Plan's 30-to-50 year timeline and the possibility of impacts that extend even beyond that timeframe, a multitude of unknowns will affect not just the water supply analysis but the analyses for every other potentially significant impact, including air quality, biodiversity, and waste management, among others. Aside from the conditions that would make tiering appropriate regardless, the uncertainties associated with the extended timeframe and novel industrial processes suggest even more strongly that future project-specific environmental impact analysis will be necessary.

The current wording of the LUA Memorandum, Initial Study, and NOP make it unclear whether and to what extent the PEIR contemplates future project-level environmental review. The Initial Study is silent on how review of individual projects will proceed under the PEIR, but the LUA Memorandum references the County's intent to provide "criteria" in the Specific Plan that will enable applicable projects "to leverage the PEIR or [be] deemed exempt from additional CEQA processing."[92] The LUA Memorandum characterizes the PEIR as being prepared "instead of" project-specific environmental impact reports.[93] It indicates that the PEIR "will include mitigation, or ways to reduce or eliminate significant environmental impacts, as well as ways to monitor and report on the mitigation measures," thereby providing "some level of CEQA clearance to future projects that are consistent with the standards and objectives of the Lithium Valley Specific Plan."[94] The LUA Memorandum states that the PEIR will "reduce the duration and quantity of individual CEQA documents being processed in the Specific Plan area" and "expedite the entitlement processing and permitting time for incoming projects."[95] Additionally, the Notice of Preparation expresses an intent to "streamline the development and permitting of" projects within the Study Area.[96]

The foregoing language needs to be clarified, as it simultaneously (1) states that the County intends to use the PEIR as a standalone document "instead of" project-specific EIRs, to

[89] Cal. Code Regs., tit. 14, § 15385.
[90] *In re Bay-Delta Programmatic Env't Impact Report Coordinated Proc.*, 43 Cal. 4th 1143, 1172 (2008).
[91] *Id.* at 1172-73; *see also Rio Vista Farm Bureau Ctr. v County of Solano*, 5 Cal. App. 4th 351, 371 (1992) (upholding a PEIR's failure to identify particular project locations on the basis of tiering, as the lead agency planned to analyze such locations in "subsequent 'project EIR's'").
[92] LUA Memorandum, *supra*, at 8.
[93] *Id.* at 4.
[94] *Id.*
[95] *Id.*
[96] Notice of Preparation, *supra,* at 1.

"exempt" specific projects from further CEQA review, and (2) implies that some degree of additional CEQA review may be necessary.

Specificity in the PEIR regarding tiering, to acknowledge the need for future project-specific environmental review, will be necessary. Even if the PEIR comprehensively analyzes all of the known environmental and public health impacts of the Specific Plan at the program level, project-specific CEQA analysis will be necessary to analyze and properly mitigate project-specific impacts that cannot properly be analyzed and mitigated in advance and with the appropriate level of specificity and detail. Such analysis must include all direct, indirect, and cumulative impacts, as well as development and analysis of mitigation measures and alternatives that reduce those impacts at both the programmatic and site-specific levels. As our water supply comments illustrate above, the level of detail required under CEQA will be impossible to achieve in a PEIR that does not contemplate tiering.

Conclusion

We appreciate your consideration of the above comments, which are intended to highlight a few key issues rather than present a comprehensive analysis of every legal issue and environmental impact that may arise in connection with the Specific Plan and PEIR. We offer these comments as a starting point at the beginning of a process that we hope will be truly collaborative, leading to innovative solutions both for transition minerals recovery and water conservation.

We expect the County to receive additional scoping comments worthy of serious consideration from area environmental justice groups, tribes, and other community members, and we stand in solidarity with their voices as persons on the frontlines of change who will be directly affected by the proposals under consideration.

The climate crisis has disproportionately harmed, and continues to harm, those who have contributed to it the least, including the residents of Imperial Valley. The United States must end our reliance on fossil fuels and transform our economy quickly and equitably to run on 100% pollution-free, clean energy, as a necessary step to stopping the climate crisis. While mineral production and processing will be a part of that transition, we must ensure that the shift away from fossil fuels avoids perpetuating environmental injustices by creating new sacrifice zones. Balancing these tensions on the scale of the proposed Specific Plan and PEIR will not be easy, but we are hopeful County will rise to the occasion.

Sincerely,

Sean B Hecht

Sean Hecht
Managing Attorney

Elizabeth A. Fisher

Elizabeth A. Fisher
Senior Attorney

Cc: Jim Minnick, Director
Imperial County Planning & Development Services Department
Via email: jimminnick@co.imperial.ca.us

Keegan Kingsbury

From: Elaine Benjamin <ebalpine@flash.net>
Sent: Monday, February 12, 2024 3:36 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

This analysis should carefully consider cumulative impacts on the entire Imperial County Air Pollution Control District, which is already severely degraded. Any worsening air quality would significantly impact public health and likely exceed legal thresholds, which must be analyzed and mitigated. Given these concerns, please consider a project alternative requiring no reduced inflow to the Salton Sea.

Thank you.

Sincerely,
Elaine Benjamin
2627 Eltinge Dr
Alpine, CA 91901

Hello my name is Emmarosa Silva, I am a lifelong resident of Imperial Valley. I'm a concerned citizen who is worried about the communities near the Salton Sea. Especially concerned about the microscopic particles that are invisible and we breathe them in without realizing how much they harm our lungs, even more those who have asthma.

Outreach is needed, having meetings won't do much, we need door to door outreach to ask residents of the impact they've seen on their health. We shouldn't wait for the people to realize it themselves or have to be told bad news they could have avoided. This is a massive project that is being developed and your planning MUST take years, with studies being done, environmentalists from a 3rd party, doctors to study the health and status of the residents who will be the most affected. Meteorologists and geophysicists must work together to analyze every potential danger and look for future disasters. We must study the "WHAT IF?"'s. What if we had a leak of hazardous material that can bring life changing altercations to anyone around it?

I've advocated for the New River since 2003, I was on committees that turned to dust and became all business. 21 YEARS of my life I've known the dangers and know what will happen if the exposure of the Salton Sea continues to grow. The pollution is already damaging our communities, let's learn how we can fix that before we decide to make billions out of it.

My alternative for you is to take no action until the proper and ethical mitigation with research, community discussion, and transparencies about funding, spendings, dangers and benefits. DO NOT take action until the communities know how your future projects will impact them.

February 20, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Air quality, other
Resident Name: Emmarosa Silva

Scoping Comments:

Emmarosa Silva, I’m writing as a concerned citizen about the small particles, smaller than small teh people may breathe & hurt their lungs. Especially asthmatic people or any one. OUtreach is needed not only having these meetings, we need door to door outreach to ask residents about their health might. - This is a big project and planning takes years studying, environmentalist, geologist doctors, meteorologists - I've advocated for the New River since 2003. I was in committees that turned to dust and became all business. 21 years of my life I've known the dangers and know what will happen with such polluted exposure. My alternative for you is to have no action until proper & ethical mitigations with research, community discussions, and transparencies about moneys, spendings, dangers, and benefits. Do not take action until the communities know how your future projects will impact them.

Keegan Kingsbury

From: Eric Weiss <ericsama2@sbcglobal.net>
Sent: Monday, February 12, 2024 6:16 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

This analysis should carefully consider cumulative impacts on the entire Imperial County Air Pollution Control District, which is already severely degraded. Any worsening air quality would significantly impact public health and likely exceed legal thresholds, which must be analyzed and mitigated. Given these concerns, please consider a project alternative requiring no reduced inflow to the Salton Sea.

Thank you.

Sincerely,
Eric Weiss
5655 Carrizo Rd
Atascadero, CA 93422

February 19, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Geology / Soils
Resident Name: Ericka Veliz
Resident City/Town: Calexico

Scoping Comments:
My name is Ericka Veliz and I'm a citizen of Calexico writing with a question as to how lithium extraction will affect the stability of the ground. Beside potentially creating seismic activity, how do we know the ground won't collapse with all the weight of equipment after lithium & brine are extracted? Will the reintroduction of brine cause reactions in the ground?

I'm worried that outside companies really have not taken the time to learn about our communities and are just eager to break ground with extraction methods that have not been tested at industrial scales. Our rural communities have already been negatively impacted by other industries (like agribusiness) and we cannot have them be damaged simply because there is demand for lithium. Asthma rates are very high in Imperial County and we can't have exposure to additional chemicals affecting the communities that are located in near proximity to the planned construction for lithium extraction.

I really hope that companies are held responsible for any and all negative impacts (on people and the environment) and I don't want tens of companies all extracting lithium at the same time. I think extraction should be measured and done in small quantities to really understand the dangers.

February 20, 2024

Planning & Development Services
Imperial County
801 W. Main St.
EL Centro, Ca. 92243

ATTN: Jim Minnick, Director & David Black, Senior Planner

RE: comments to NOP on Lithium Valley Specific Plan/EIR

Jim and David:

This brief letter comments in a general way on the proposed preparation of an EIR for the Lithium Valley Specific Plan.

EnergySource Minerals, is nearing the start of construction on a Lithium (as well as other minerals) extraction plant, that is located adjacent to the Featherstone Geothermal Plant owned by CYRQ.

We have reviewed the draft Specific Plan and have previously commented on and noted our concerns over the proposed land use designation. We reiterate that if it is the intent of the county to enhance the development of the geothermal resource and thereby to the assist in the permitting of new projects, it is critical that the land use designations seriously consider the underlaying resource locations and not unnecessarily restrict through your zoning the use of the overlaying land..

In discussions with your consultant, we were informed that through the land use ordinance process, there would be specifics that would address this concern. However, not being privy to such an ordinance we can only request again that the designation of appropriate land uses is critical. If developments that plan to use certain areas will still need to do General Plan Amendments or be otherwise restricted, it does not appear that your stated goal of "enhancing the development of the resource area" will be achieved.

With regard to the preparation of the EIR, we understand this to be a "program level" EIR. It would be most beneficial if the level of detail would enable future projects to be permitted with Mitigated Negative Declarations to the extent possible. We recognize that some projects may be of a magnitude that would still require them to do a focused EIR.

We look forward to the opportunity to review and comment on a more detailed Specific Plan and the Draft EIR.

Sincerely

Jurg Heuberger

EnergySource Minerals LLC

Cc: Derek Benson, COO

Keegan Kingsbury

From: Dodger <gaildodger@gmail.com>
Sent: Tuesday, February 20, 2024 8:16 AM
To: Jim Minnick
Subject: Lithium Valley Plan Project

CAUTION: This email originated outside our organization; please use caution.

February, 19th, 2024
Jim Minnick
801 Main Street
El Centro, CA 92243
Re: Imperial County's Program Environmental Impact Review for the Lithium Valley Specific Plan

Dear Mr. Jim Minnick,

On behalf of myself I am pleased to offer scoping comments for Imperial County's Program Environmental Impact Report (PEIR) for the proposed Lithium Valley Specific Plan Project (Project) (SP22-0001). We understand that the Lithium Valley Specific Plan and PEIR is intended to provide a framework and guidance for the necessary infrastructure and facilities and streamline the development and permitting of additional renewable energy facilities, mineral recovery, lithium battery manufacturing, and other renewable industries within an approximately 51,786-acre area adjacent to the Salton Sea. Currently, the Imperial County Planning & Development Services Department is seeking the community's comments about the effects this project might have on the environment and suggestions as to alternatives, mitigation or ways the project may be revised to reduce or avoid any significant environmental impacts.

I, Gail Boswell, would like to recommend that the following topics be analyzed in the PEIR:
Aesthetics
Agriculture and Forestry Resources
Air Quality
Biological Resources
Cultural Resources
Cumulative Effects
Drainage/Absorption
Geology/Soils
Hazards & Hazardous Materials
Hydrology/Water Quality
Land Use/Planning
Mineral Resources
Noise
Population/Housing
Public Services
Recreation
Schools/Universities
Septic System
Sewer Capacity
Solid Waste
Transportation
Vegetation
Wetland/Riparian

Wildfire
The future levels of the Salton Sea body of water The long term plan to prevent stranded infrastructure Overall project cleanup agenda Making sure that cleanup costs don't fall upon the town/county/state people and taxpayers The companies involved will be held responsible for any environmental disaster, no matter how big or how small.

These topics listed above are of great concern because of the environmental impact that it will have on myself, my property, and the surrounding community, be it direct, indirect, or cumulative impacts. The analysis should consider the impacts of these topics because of the importance of the impact on the geography, and affected populations within Imperial County.
Thank you for taking the time to consider my suggested topics for analysis. I am looking forward to seeing my comments reflected in the draft of the Programmatic Environmental Impact Review for the Lithium Valley Specific Plan.

Best regards,

Gail Boswell
Considering being a Resident of Bombay Beach, CA

February 20, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Air Quality, Cumulative Effects, Hazards and Hazardous Materials, Land Use/Planning, Population/Housing, Public Services, Transportation
Resident Name: Gilberto Manzanarez
Resident City/Town: Calexico

Scoping Comments:

My name is Gilberto Manzanarez, a resident of Calexico. I want to share my concerns on the minor space being designated for conservation and area for community opportunities. Quite frankly, many of the people I've talked to share a common sentiment, the solar panel expansion and project did not benefit the greater communities of the valley. This is an opportunity for the county to do this project right by the valley and the people. Do not place the people and the environment second to profits.

Keegan Kingsbury

From: Giovannina Fazio <fazio@sndden.org>
Sent: Monday, February 12, 2024 1:38 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

This analysis should carefully consider cumulative impacts on the entire Imperial County Air Pollution Control District, which is already severely degraded. Any worsening air quality would significantly impact public health and likely exceed legal thresholds, which must be analyzed and mitigated. Given these concerns, please consider a project alternative requiring no reduced inflow to the Salton Sea.

Thank you.

Sincerely,
Giovannina Fazio
3431 Foothill Blvd
Oakland, CA 94601

Keegan Kingsbury

From: GREG D <greg@greybearddesign.com>
Sent: Monday, February 12, 2024 1:29 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

This analysis should carefully consider cumulative impacts on the entire Imperial County Air Pollution Control District, which is already severely degraded. Any worsening air quality would significantly impact public health and likely exceed legal thresholds, which must be analyzed and mitigated. Given these concerns, please consider a project alternative requiring no reduced inflow to the Salton Sea.

Thank you.

Sincerely,
GREG D
1525 Highland Dr
Mount Shasta, CA 96067

Keegan Kingsbury

From: henriette brouwers <info@lapovertydept.org>
Sent: Monday, February 12, 2024 4:03 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

This analysis should carefully consider cumulative impacts on the entire Imperial County Air Pollution Control District, which is already severely degraded. Any worsening air quality would significantly impact public health and likely exceed legal thresholds, which must be analyzed and mitigated. Given these concerns, please consider a project alternative requiring no reduced inflow to the Salton Sea.

Thank you.

Sincerely,
henriette brouwers
250 S. Broadway
los angeles, CA 90012

February 19, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Seismic Activity, Other
Resident Name: Henry Daker
Resident City/Town: Niland

Scoping Comments:

I live in Niland and I am concerned about the potential seismic activity that can come from these new developments. In February Imperial County suffered a series of earthquakes that shook the entire county. Knowing that we are already on the San Andreas fault I am worried that earthquakes will start to happen more frequently. Please study how seismic activity can be triggered by these new developments whether that is because of the extraction or because of the reinjection of the brine. Please find an alternative that won't cause seismic activity to happen with more frequency in our area.

Cyrq
Hudson Ranch

February 20, 2024

Jim Minnick
Director, Imperial County Planning & Development Services Department (the "County")
801 Main Street
El Centro, CA 92243

By email to: jimminnick@co.imperial.ca.us
davidblack@co.imperial.ca.us

RE: Lithium Valley Specific Plan Notice of Preparation

Dear Mr. Minnick:

This letter is with regard to the Lithium Valley Specific Plan ("LVSP") Notice of Preparation. These comments are submitted on behalf of Hudson Ranch Power I LLC ("Hudson Ranch"), owner of the John L Featherstone Geothermal Power Plant ("Power Plant"), which is situated within the LVSP's planning area.

Water Use

Hudson Ranch believes that the LVSP needs to consider the collective impact on fresh water as additional non-agricultural facilities are proposed. This isn't to say there should be a moratorium on future development, but that evaluation of any such development must include how the project contributes to the cumulative impact on fresh water supplies.

Land Use

The preferred alternative designates conservation areas that overlap with proposed development that is undergoing permitting. How will this be resolved if the conservation designation remains? Will this create a rush to get projects permitted before the LVSP is finalized?

Resource Management

The Salton Sea area holds great potential for renewable energy, but only if the geothermal resource is properly managed for long term sustainability. The truth is that we are still learning about the Salton Sea's potential. Visuals often designate areas that are "Proven" as well as areas that represent estimates of "Ultimate capacity," i.e., areas that are unproven. The Proven area is generally agreed to be able to support approximately 990 MW. This number is based on actual production of existing Salton Sea power plants in the Proven area since 1988, including Hudson Ranch and several existing CalEnergy/Berkshire Hathaway power plants. As

additional geothermal resources are slated for power generation and/or lithium production, decision-makers must consider the overall resource sustainability of the Salton Sea Geothermal Field. Experts have called for a robust and integrated numerical model to facilitate extraction of the field's lithium and geothermal energy due to concerns about decline or chemical breakthrough.[i]

The LVSP, and/or its regulations, must provide tools that evaluate cumulative impacts from the expected facilities/industries/uses in order to effectively consider and monitor these impacts. The goal must be ensuring that Lithium Valley remains a viable resource. California has already witnessed the effects of overdevelopment in the Geysers. While there are differences between the resources at Salton Sea and the Geysers, the lesson learned from the Geysers cannot be ignored: there are limitations on how much the resource can be developed. This limit can be termed "power density." The known power density for the Salton Sea is 30-35 MW/km^2, and regulations should guarantee that this density is not exceeded. That being said, not every area of the Salton Sea performs the same. Has the LVSP trued-up the surface planning with what is known about the underground resource? Can the resource handle the aggregation of brine extraction in the areas slated for development? Or will the regulations also need to implement something like well spacing requirements and extraction caps to prevent pressure decline and other interfering effects between projects?

For example, Hudson Ranch has analyzed the Morton Bay Geothermal Project's proposed wells, which are sited relatively close to Hudson Ranch's wells. Morton Bay's pumping is predicted to result in reservoir pressure drawdown in the area of Hudson Ranch's production wells. This means lower well head pressure and consequently lower flow for the production wells. Hudson Ranch cannot compensate for the loss of pressure by flowing more fluid as the power plant design is fixed and relies on high pressure steam. Since the power plant design is fixed, following a pressure drawdown, the existing wells will have to be operated at a lower flow rate in order to hold pressure constant. This lower flower rate translates to a reduction in generation, which has a financial impact on Hudson Ranch. In order to maintain the amount of electricity currently generated by Hudson Ranch, we will need to drill new wells that operate at the higher, necessary pressure.

Hudson Ranch respectfully suggests that operators, developers and the County need to fully understand the geothermal resource through a performance analysis, with a particular focus on proximity between operators and their wells to ensure the resource remains viable for years to come. Operational spacing is implied in state law but does not explicitly focus on density of operators or proximity between wells. Rather, state law ensures that geothermal wells cannot be located within 100' of a public road or outer boundary of a parcel, or 25' of a public road or outer boundary when "all or substantially all of the [parcel] surface is unavailable for the location of a geothermal well." Cal. Public Resources Code 3757; 3757.1. This void in regulation creates an opportunity for the County to create its own more stringent spacing rules to protect the geothermal resource. As the County studies geothermal performance in the area and implements policy related to geothermal energy resources, we respectfully suggest that it should reference similar guidance in state law for oil and gas, which provides for set spacing between wells. *See* Cal. Public Resources Code 3600; 3602; 3606; 3607. While geothermal resources

will not be identical to oil and gas, the goal and premise of state law can act as a guide for the County.

In addition to well spacing, Hudson Ranch respectfully suggests that the County should consider requiring a developer to bear the burden of demonstrating that its proposed use is an efficient, optimizing use of the geothermal resource. For example, Hudson Ranch's modeled analysis of the proposed Morton Bay project demonstrates that it must be re-sized, relocated, or both to preserve the ability for long term utilization of the shared geothermal resource.

Hudson Ranch believes that a collaborative, field-wide reservoir model for the Salton Sea Geothermal Field is needed to inform future development, optimize the geothermal resource for long term sustainability, and prevent wasteful use of the resource.

Conclusion

We thank you for considering these comments intended to balance the benefits of new development anticipated and facilitated by the LVSP with appropriate mitigation of environmental and economic effects to existing operators, like Hudson Ranch.

Sincerely yours,

HUDSON RANCH POWER 1 LLC

Name: Joseph F. Bannon
Title: Vice President, Environment & Utility Relations

cc (by email only):
Nicholas Goodman, CEO, Cyrq Energy
David Blac, Imperial County, Planner

[i] O'Sullivan J., Araya N., Popineau J., Renaud T., and Riffault J.: A Natural State and Production Forecast Model of the Salton Sea Geothermal Field for Lithium Extraction, GRC Transactions (2023). See also McKibben, M.: Salton Sea geothermal lithium: reserves and comparison with other lithium resources, presentation to the Blue Ribbon Commission on Lithium Extraction in California ("Li production appears sustainable, but we need a far more dynamic Li reservoir model that takes into consideration more factors such as reinjection and Li replenishment.")

February 14, 2024

Mr. Jim Minnick
Planner IV
Planning & Development Services Department
County of Imperial
801 Main Street
El Centro, CA 92243

SUBJECT: NOP of a PEIR for the Lithium Valley Specific Plan Project

Dear Mr. Minnick:

On December 7, 2023, the Imperial Irrigation District received from the Imperial County Planning & Development Services Department, a request for agency comments on the Notice of Preparation of a Program Environmental Impact Report for the Lithium Valley Specific Plan Project. The Lithium Valley Specific Plan and PEIR is intended to provide a framework and guidance for the necessary infrastructure and facilities and streamline the development and permitting of additional renewable energy facilities, mineral recovery, lithium battery manufacturing, and other renewable industries within an approximately 51,786-acre area adjacent to the southeastern shore of the Salton Sea.

The IID has reviewed the NOP of the PEIR and has the following comments:

1. Proponents of projects to be sited within the specific plan that will require electrical service for construction and/or operation should be advised to contact Gabriel Ramirez, IID Service Planner, at (760) 339-9257or e-mail Mr. Ramirez at gramirez@iid.com to initiate the customer service application process. In addition to submitting a formal application (available for download at http://www.iid.com/home/showdocument?id=12923), proponents will be required submit, electrical plans, electrical panel size and location, operating voltage, electrical loads, an AutoCAD file of the site plan, construction schedule, and the applicable fees, permits, easements and environmental compliance documentation pertaining to the provision of electrical service to the project. The proponents shall be responsible for all costs and mitigation measures related to providing electrical service to their projects.

2. To properly assess for potential impacts, as covered in the environmental factor "XIX. UTILITIES AND SERVICE SYSTEMS" of the Initial Study Checklist, to determine if a project within the specific plan will require or result in the relocation or construction of new or expanded electric power facilities, the construction or relocation of which could cause significant environmental effects, a circuit study/distribution impact study, facility study, and/or system impact study will have to be performed. Any system improvements or mitigation identified in such studies to accommodate a project shall be the responsibility of the project proponent.

3. **Water Supply Policy** – IID's Interim Water Supply Policy currently designates up to 25,000 AFY of water for conservation for potential Non-Agricultural Projects within IID's water service area. As of December 12, 2023, Imperial County has issued land use entitlements to numerous non-agricultural developments within their jurisdiction in volumes that exceed the 25,000 AFY that has been set aside by IID for conservation. The Draft EIR will need to independently assess the project's impacts to IID's available water supply. More information on how to obtain a water supply agreement, is available at the district website https://www.iid.com/water/municipal-industrial-and-commercial-customers or by calling Justina Gamboa-Arce, IID Water Resources Planner, at (760) 339-9085 or by writing Ms. Gamboa-Arce at jgamboaarce@iid.com.

4. **Land Use Plans/SPA's Water Assessment** – Imperial County should ensure that the water supply component of their respective planning document is comprehensive and based upon current information. Among other things, the SPA should assess the direct, indirect and cumulative potential impacts on the environment of using currently available water supplies and/or conserved water for new industrial, municipal, commercial and/or institutional uses instead of the historical use of that water for agriculture. Such a change in land use, and the associated water use, could potentially impact land uses, various aquatic and terrestrial species, water quality, air quality and the conditions of drains, rivers and the Salton Sea.

5. **Water Infrastructure Access Limitations** – Over 33% of the acreage within the SPA does not have a lateral canal immediately accessible for water delivery. Development of the SPA may necessitate the extension of water distribution infrastructure into some of the planned development areas. Impacts would need to be assessed under a programmatic EIR.

6. **Canal System Capacity** – The capacity of the canal system within the SPA is limited and already runs at maximum capacity during certain times of the year. Accommodating a water supply above current demands would necessitate substantial water infrastructure modifications, which may include, but not be limited to, a new canal, existing lateral enlargement, culvert replacements, intertie construction, regional water storage pond(s), etc.

7. **Drain Infrastructure Access Limitations** – Over 25% of the acreage within the SPA does not have a drain immediately accessible for drain water collection. Development of the SPA may necessitate the extension of drainage into some of the planned development areas. Impacts would need to be assessed under a programmatic EIR, particularly as it relates to impacts to biological resources.

8. **Impacts to the Salton Sea from Drain Flow Reduction** – In general, industrial/commercial land uses are not allowed to discharge into IID drains. As such, 100 percent (100%) of the water supply demand for the project is anticipated to result in a permanent, annual, net reduction of flow to the Salton Sea. Loss of flow to the Salton Sea impacts numerous biological resources and creates air quality impacts from receding shoreline. "The impacts to the Salton Sea, due to loss or reduction of agricultural runoff caused by agricultural land conversion to urban use shall be discussed in the document. Due to the potential loss or reduction of inflow to the Salton Sea and to IID

drains with its concurrent environmental impacts, developer should address this issue as well as provide analysis that the project does not negatively impact the IID Water Conservation and Transfer Draft Habitat Conservation Plan, the existing Section 7 Biological Opinion and the California Endangered Species Act Permit 2081.

An assessment or discussion of cumulative impacts considering other non-agricultural facilities whose water use (or potential water use) would reduce the inflow conveyed to IID drains and the Salton Sea is necessary. It is advisable that project proponent present a cumulative impact analysis on inflow to IID drains and the Salton Sea.

The following are access links to the documents mentioned:

- The HCP is part of the IID Water Conservation and Transfer Project, Final EIR/EIS and can be found at the website Water/Library/QSA-Water-Transfer/Environmenta-Assessment/Permits/Final EIREIS; Volume II, Appendix A Species Covered by the HCP. The HCP in the Draft EIR/EIS may contain small changes from the final version of the EIR/EIS. It is in a different appendix in the draft that the final EIR/EIS (Appendix C). Until the final HCP/Natural Community Conservation Plan is approved, IID uses the draft HCP in the draft document, which can be accessed at Water/Library/QSA-Water-Transfer/Environmental-Assessment).
- The Biological Opinion (federal Endangered Species Act permit) is available at https://www.iid.com/Imperial-Irrigation-District/Salton-Sea-Areas.
- The CESA 2081 (the water transfer operates under this state ESA permit until the NCCP is approved) can be found at https://www.iid.com/water/library/qsa-water-transfer/environmental-assessments-permits/cesa-compliance.
- The MMRP (Mitigation Monitoring and Report Program) is accessible at https://www.iid.com/Water/Library/QSA-Water-Transfer/Mitigation.

9. To insure there are no impacts to IID water facilities, construction plans for projects developed within the specific plan, including grading & drainage and fencing plans, should be submitted to IID Water Department Engineering Services Section for review prior to final project design. For additional information IID WDES Section should be contacted at (760) 339-9265.

10. A project may impact IID drains with project site runoff flows draining into IID drains. To mitigate impacts, a comprehensive IID hydraulic drainage system analysis may be required. IID's hydraulic drainage system analysis includes an associated drain impact fee.

11. For construction water, project proponents will need to submit a Temporary Water Account Application to the IID. Furthermore, the use of IID water during a project's construction phase will require an encroachment permit. Once the project moves forward an onsite reservoir will need to be designed and constructed by the applicant to ensure that the project has at least a six-day supply of water available in case of maintenance or construction projects on the supply canal. For additional information regarding construction water, the applicant should contact IID's Water Department North End Division at (760) 482-9900.

12. Due to changes in the state and federal Safe Drinking Water Acts, when developing a project, it is important to remember potable water regulations if access to a municipal water system is not available. Since the IID is a regional supplier of raw water, please remember that its canal water is not suitable for drinking and cooking purposes. To comply with the SDWA and reinforce that its water supply is not intended for human consumption, the IID has implemented rules to ensure that its piped water customers also have an alternative water supply that achieves an equivalent level of public health protection for drinking and cooking purposes. The applicant must be in compliance with California's Safe Drinking Water Act and receive their potable water from one of the four approved water providers located in Imperial County if a permitted public water system is not required by Imperial County as a part of this project.

13. Project proponents within the specific plan will be required to provide rights of way and easements for any proposed power line extensions and/or any other infrastructure needed to serve the project as well as the necessary access to allow for continued operation and maintenance of any IID facilities located on adjoining properties. Proponents shall provide a surveyed legal description and associated exhibit certified by a licensed surveyor for all rights of way deemed necessary by IID to accommodate a project's electrical infrastructure. ROWs and easements shall be in a form acceptable to and at no cost to IID for installation, operation, and maintenance of all electrical facilities.

14. Public utility easements over all private public roads and additional ten (10) feet in width on both side of the private and public roads shall be dedicated to IID for the construction, operation, and maintenance of its electrical infrastructure.

15. Any construction or operation on IID property or within its existing and proposed right of way or easements including but not limited to: surface improvements such as proposed new streets, driveways, parking lots, landscape; and all water, sewer, storm water, or any other above ground or underground utilities; will require an encroachment permit, or encroachment agreement (depending on the circumstances). A copy of the IID encroachment permit application and instructions for its completion are available at the website https://www.iid.com/about-iid/department-directory/real-estate. The district Real Estate Section should be contacted at (760) 339-9239 for additional information regarding encroachment permits or agreements. No foundations or buildings will be allowed within IID's right of way.

16. In addition to IID's recorded easements, IID claims, at a minimum, a prescriptive right of way to the toe of slope of all existing canals and drains. Where space is limited and depending upon the specifics of adjacent modifications, the IID may claim additional secondary easements/prescriptive rights of ways to ensure operation and maintenance of IID's facilities can be maintained and are not impacted and if impacted mitigated. Thus, IID should be consulted prior to the installation of any facilities adjacent to IID's facilities. Certain conditions may be placed on adjacent facilities to mitigate or avoid impacts to IID's facilities.

17. Any new, relocated, modified or reconstructed IID facilities required for and by a project (which can include but is not limited to electrical utility substations, electrical transmission and distribution lines, water deliveries, canals, drains, etc.) need to be included as part of

the project's CEQA and/or NEPA documentation, environmental impact analysis and mitigation. Failure to do so will result in postponement of any construction and/or modification of IID facilities until such time as the environmental documentation is amended and environmental impacts are fully analyzed. Any and all mitigation necessary as a result of the construction, relocation and/or upgrade of IID facilities is the responsibility of the project proponent.

18. Dividing a project into two or more pieces and evaluating each piece in a separate environmental document (Piecemealing or Segmenting), rather than evaluating the whole of the project in one environmental document, is explicitly forbidden by CEQA, because dividing a project into a number of pieces would allow a Lead Agency to minimize the apparent environmental impacts of a project by evaluating individual pieces separately, each of which may have a less-than-significant impact on the environment, but which together may result in a significant impact. Segmenting a project may also hinder developing comprehensive mitigation strategies. In general, if an activity or facility is necessary for the operation of a project, or necessary to achieve the project objectives, or a reasonably foreseeable consequence of approving the project, then it should be considered an integral project component that should be analyzed within the environmental analysis. The project description should include all project components, including those that will have to be approved by responsible agencies. The State CEQA Guidelines define a project under CEQA as "the whole of the action" that may result either directly or indirectly in physical changes to the environment. This broad definition is intended to provide the maximum protection of the environment. CEQA case law has established general principles on project segmentation for different project types. For a project requiring construction of offsite infrastructure, the offsite infrastructure must be included in the project description. *San Joaquin Raptor/Wildlife Rescue Center v. County of Stanislaus* (1994) 27 Cal.App. 4th 713.

Should you have any questions, please do not hesitate to contact me at 760-482-3609 or at dvargas@iid.com. Thank you for the opportunity to comment on this matter.

Respectfully,

Donald Vargas
Compliance Administrator II

Jamie Asbury – General Manager
Mike Pacheco – Manager, Water Dept.
Matthew H Smelser – Manager, Energy Dept.
Geoffrey Holbrook – General Counsel
Michael P. Kemp – Superintendent General, Fleet Services and Reg. & Environ. Compliance
Laura Cervantes. – Supervisor, Real Estate
Jessica Humes – Environmental Project Mgr. Sr., Water Dept.

Hello, my name is Ismael Arvizu, I am a concerned resident from Calexico. Lithium Valley will have too many dangerous impacts on the communities it will neighbor and even past mine, will be affected. My main 3 concerns are air quality, wildlife, and indigenous culture.

The significance of the impact is creating the already extremely unhealthy air quality that we have into the worst it's ever been. The American Lung Association gives Imperial Valley an F in High Ozone Days. The closer you are to the Salton Sea the dust that you breathe that holds microscopic metals and dried-up agricultural waste from all generations. The Salton Sea is a caldo of death that when dry will have Lithium Valley wondering why so many sick hours are being used. Plus with the Lithium plants needing tons of water, we can expect a quicker decline of water. I suggest rehabilitating the Sea to allow more possibilities. Nature will always end up winning so we must work alongside it to not have us be on its bad side.

This takes me to my next concern, wildlife. Did you know that the biggest aerial migration highway will be above your head? The Salton Sea has been termed a "crown jewel of avian biodiversity" by Milt Friend of the Salton Sea Science Office. It is a massive DUCK stop for the Pacific Flyway. We must do our part and best work to help the global ecosystem thrive. The hypersalinity and presence of contaminants in the Salton Sea triggered massive die-offs in the fish as well as the contamination and spread of avian cholera. This killed off most of the American white pelican and other birds. If we continue to ignore nature's cries, then we must suffer the consequences in later days. What will happen when there is no water and no ability to sustain life?

Finally, life. Who lived for thousands of years on the land and sea that we are mindlessly farming and mining. Who treated the land with care without having to use fancy machinery to build a society and progress. The people of the First Nations have a culture and an ideology that nurtured the land before the colonizers came. The "Heartbeat of Mother Earth" is a tale that we must not ignore or forget. It is a must for you to consult and ask for permission and advice about the use of the land. How can we create this Lithium Valley while keeping history transparent and changing the ways that industrialization made humans greedy for the land more than ever? Instead of pushing aside and giving hush money or other assets. We should try to honor the teachings of the ancestors who worked the land.

I urge you to take action but only for more research on how you can improve the air quality or at least not add to the pollution we already have. Learn about the thousands of wildlife that use the Sea you're trying to use as well, it won't be here forever unless we start working on its restoration. Above all, we must honor the land as thousands of generations have done so before, and will hopefully bring prosperity and equal opportunity to our impoverished communities.

February 19, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Aesthetics, Air Quality, Biological Resources, Cultural resources, Cumulative Effects, Geology/Soils, Hazards and Hazardous Materials, Hydrology/Water Quality, Land Use/Planning, Mineral Resources, Noise, Population/Housing, Public Services, Recreation, Schools/Universities, Septic System, Sewer Capacity/Solid Waste, Transportation, Vegetation, Wetland/Riparian, Wildfire
Resident Name: Ivan DelSol
Resident City/Town: Bombay Beach

Scoping Comments:
I've recently moved to Bombay Beach and am concerned with my own health and well being, as well as that of my neighbors and of the surrounding environment

Extraction technologies are notoriously intrusive and destructive. All options need to be considered as well as the impacts on the environment and residents.

Imperial Valley Equity & Justice Coalition

February 20, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Scoping Comments on Lithium Valley Specific Plan and Programmatic Environmental Impact Report

Imperial Valley Equity and Justice Coalition (IVEJC) is writing to formally submit our organization's scoping comments to inform the Draft Environmental Impact Report for the Lithium Valley Specific Plan.

IVEJC is a community power building organization that advocates for civic engagement, health equity, and environmental and social justice. IVEJC was awarded funds from the SB 125 Lithium Extraction Law Section 8 (C)(2) that states: "Eight hundred thousand dollars ($800,000) to distribute grants for engagement by community-based organizations in the county on the programmatic environmental impact report created by the county for lithium and geothermal energy development efforts in the county." Soon after the grant period launched, we began our program to conduct outreach, education, engagement, and community participatory research to inform Imperial Valley residents and stakeholders about the County programmatic environmental impact report and lithium valley specific plan development processes, to provide them with a comprehensive overview of lithium developments including progress and key milestones and opportunities for community engagement/public comment periods with the County of Imperial, and among other goals, to serve as a facilitator of resident input to the County of Imperial in their key public comment periods. From September 2023 to present day, IVEJC has engaged with and provided education to hundreds of residents and stakeholders in the cities of Niland, Calipatria, Westmorland, Bombay Beach, Holtville, Ocotillo, Imperial, El Centro, Calexico, and in the Quechan Tribal Nation. In this period, we hosted numerous resource tables and lithium community meetings. The comments reflected in this letter are informed by our experiences engaging with the community.

As a collective organization, we believe that every Imperial County resident deserves to live, work, dream, and thrive. And while we support the urgency to move away from fossil fuels to fully rely on clean energy and understand the proposed role for Imperial County given the large lithium deposits found in the southeast shore of the Salton Sea, we believe that people and our environment deserve to be protected and not sacrificed at the expense of corporate profit. Unfortunately, the decades leading up to this moment are marked by a historical marginalization and exploitation for resources to export to the rest of the nation and globe; deeply rooted health

disparities (i.e., child emergency room visits due to asthma[1]) due to textbook examples of environmental racism at the Salton Sea; and a lack of investment in infrastructure for our health care, transportation, electric grid, and water systems. Together, the history of the past several decades makes for alarming baseline conditions, sensitive populations, and at an elevated risk for harmful cumulative environmental impacts. Below, we include questions, concerns, suggested alternatives, and research and data to include in the Programmatic Environmental Impact Report.

We start by including a current environmental landscape in the Census Tract making up the study area (CalEnviroScreen 4.0)[2]. On a scale of 0-100 with 90-100 being the highest scores:

- CalEnviroScreen 4.0 Percentile: 82
- Pollution Burden Percentile: 63
- Population Characteristics Percentile: 86
- Exposures:
    - Pesticides: 91
    - Drinking Water: 31
- Environmental effects:
    - Cleanup Sites:74
    - Groundwater Threats 78
    - Hazardous Waste: 93
    - Impaired Waters: 100
    - Solid Waste: 87
- Sensitive Populations:
    - Asthma: 88
    - Cardiovascular Disease: 83

Among other concerns, one that stands out is that direct lithium extraction technology using geothermal energy is new and not proven at a commercial scale, therefore cumulative impacts are unknown. Please study an alternative where a comprehensive and robust mitigation plan is developed to ensure that the development of Lithium Valley does not further burden Imperial Valley residents from environmental hazards. A mitigation plan to set into motion prospective longitudinal studies to follow the health status and environmental indicators in the nearby towns of Niland, Calipatria, Bombay Beach, and other nearby cities that are negatively impacted by the toxic dust in the air from the exposed Salton Sea shoreline.[3] Given the existing concerns, we ask that you study an alternative for water conservation with no reduced inflow to the Salton

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[1] Farzan, S. F., Razafy, M., Eckel, S. P., Olmedo, L., Bejarano, E., & Johnston, J. E. (2019). Assessment of Respiratory Health Symptoms and Asthma in Children near a Drying Saline Lake. International Journal of Environmental Research and Public Health, 16(20), Article 20. https://doi.org/10.3390/ijerph16203828
[2]CalEnviroScreen 4.0 California Office of Environmental Health Hazard Assessment https://experience.arcgis.com/experience/11d2f52282a54ceebcac7428e6184203/page/CalEnviroScreen-4_0/

[3] See: Johnston, J. E., Razafy, M., Lugo, H., Olmedo, L., & Farzan, S. F. (2019). The disappearing Salton Sea: A critical reflection on the emerging environmental threat of disappearing saline lakes and potential impacts on children's health. *Science of The Total Environment*, 663, 804–817.

Sea. The specific plan proposes converting agricultural land to industrial uses. The Salton Sea currently receives water through agricultural drainage. Converting this farmland would then reduce the inflow to the Salton Sea, speeding up the recession of the sea and exposure of playa, leading to an indirect impact on air quality. The PEIR must analyze reasonably foreseeable direct, indirect, and cumulative impacts in the following areas:

a. *Aesthetics:* The potential impacts on the Sonny Bono Salton Sea National Wildlife Refuge, the possibility of increased mud pots (created by geothermal activity), impacts on Red Hill Park, and the potential effects on Obsidian Butte raise significant concerns. These impacts not only affect the visual appeal of the area but also have the potential to disrupt natural landscapes, significantly impacting the scenic beauty, recreational value for residents, visitors, and wildlife. Please find an alternative where these impacts are avoided and the area is preserved.

b. *Agriculture and Forestry:* The failure to identify fields transitioning to any other use poses a significant concern. Without proper categorization of land use, it is challenging to foresee and address future impacts on agriculture. This lack of foresight could adversely affect the livelihoods of farmworkers that have been displaced by other industries like Solar and have a detrimental impact on the local economy and community nearby.

c. *Air Quality:* The absence of data on poor air quality near geothermal sites, particularly in Niland and its school, is alarming. This lack of information raises concerns about the health and well-being of residents, especially schoolchildren. Mitigation plans for schools and communities are imperative to address potential health risks from air pollution. We ask that a comprehensive air monitoring mitigation plan is established in collaboration with community stakeholders.
    i. Please include the CalEnviroScreen 4.0 in your analysis of air quality and sensitive populations: https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-40

d. *Biological:* The potential impacts on the Salton Sea, a critical migration stopping point for birds and a home for pup fish, warrant serious consideration. Endangered species preservation and ecosystem health are at stake, making it essential to study and mitigate impacts on sensitive habitats.

e. *Tribal Cultural Resources:* Concerns about the safety of Obsidian Butte highlight the importance of preserving cultural heritage and historical sites. The potential risks to cultural sites must be carefully considered to ensure their protection for future generations. We ask that proper tribal consultation is respected and completed. We have heard multiple accounts that thorough consultation on cultural sites have not been honored. It is critical to acknowledge not just the potential unearthing of archaeological artifacts and site-specific cultural resources during development, but also to provide relevant mitigation measures for obtrusion on a viewshed within a broader cultural

landscape that includes nearby sacred sites, including mud pots, steam vents, Mullet Island, Rock Hill, Red HIll, and Obsidian Butte.

f. *Geology and Soils:* The lack of information on the current condition of the land, particularly its proximity to the San Andreas Fault, is concerning. In an investigation of seismic response to fluid injection and production in two Salton Trough geothermal fields in southern California, researchers observed a correlation between injection volumes and the frequency of induced earthquakes, suggesting a potential scaling relationship between the two variables[4]." Understanding the geological risks associated with new developments is crucial for planning and mitigating potential hazards, such as earthquakes. Please study all possible impacts of continuously resorting to our aquifers.

g. *Greenhouse:* Concerns about increased diesel/gas truck traffic, emissions from the Salton Sea, and additional emissions from proposed developments raise significant environmental and health concerns. Mitigation plans are necessary to address the potential health risks associated with increased pollution. Please study the impact of the study on climate change.

h. *Hazards:* The lack of transparent information on types of hazardous waste being transported and potential impacts of spills on the environment is troubling. Please study the type and amounts of hazardous waste that will be produced by lithium extraction plants within the specific plan area, including an analysis of how waste will be stored, transported, and disposed of. This analysis should include the hazardous brine elements such as arsenic and lead that may precipitate out onto filter cakes as part of the Direct Lithium Extraction process. As a mitigation strategy, studying and mitigating potential hazards are essential to safeguard public health and ecosystems. It'll be important for the companies to have a public reporting system about the amount of waste that is being created on a daily basis.

i. *Public Services:* Concerns about the ability of the north end including NIland and Calipatria to handle emergencies reinforce the importance of effective mitigation efforts. Adequate emergency preparedness and response are essential for ensuring public safety and infrastructure resilience. To properly mitigate any adverse impacts from increased exposure to environmental hazards, Niland and Calipatria need a hospital and robust urgent care center as a mitigation strategy.

j. *Wildlife:* The potential impacts on wildlife populations and habitats in nearby communities are of utmost concern. Safeguarding biodiversity and ecosystem health requires careful consideration and mitigation of impacts on wildlife. Analyze and report on all organisms impacted by this development.

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4 Lajoie, L. J. (2012). Seismic response to fluid injection and production in two Salton Trough geothermal fields, southern California. UC Santa Cruz. ProQuest ID: Lajoie_ucsc_0036N_10235. Merritt ID: ark:/13030/m5q241xm. Retrieved from https://escholarship.org/uc/item/7gr8x35f

k. *Freshwater consumption*: If you could please study how freshwater consumption in the Specific Plan Area would reduce inflow to the Salton Sea, and impact air quality from exposed playa. This analysis should consider impacts on the entire Imperial Air Basin, which is already degraded, because any worsening air quality would have a significant impact on public health. It is reasonably foreseeable that the project would expose more playa and impact air quality because the Salton Sea is fed by agricultural drainage, and farmland will be converted to industrial uses. Please also consider an alternative that requires no reduced inflow to the Salton Sea.

Thank you for taking the time to consider the noted topics to be included in the analysis during the PEIR and Lithium Valley Specific Plan. We would like to see the analysis on all topics submitted by our coalition. We are looking forward to reviewing these items in the draft Lithium Valley Specific Plan and Programmatic Environmental Impact Report.

Respectfully,

Daniela Flores, MPH
Executive Organizer
Imperial Valley Equity and Justice Coalition
dflores@ivequityjustice.org

February 20, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Scoping Comments on Lithium Valley Specific Plan and Programmatic Environmental Impact Report

Imperial Valley Equity and Justice Coalition is writing to formally submit scoping comments on behalf of a subset of Imperial County residents to inform the Draft Environmental Impact Report for the Lithium Valley Specific Plan. From September 2023 to present day, IVEJC has engaged with and provided education to hundreds of residents and stakeholders in the cities of Niland, Calipatria, Westmorland, Bombay Beach, Holtville, Ocotillo, Imperial, El Centro, Calexico, and in the Quechan Tribal Nation. In this period, we hosted numerous resource tables and lithium community meetings. At every community meeting, residents and stakeholders expressed a desire to participate in the PEIR processes and provided specific comments about their environmental concerns and the environmental questions that they want included in the Programmatic Environmental Impact Report. Below, we include key comments from residents and supporting research where possible.

#	Location	Scoping Comment	Category	Research
1	Calipatria	“My question is, you touched on the waste stream going to the landfills and hazardous, non-hazardous. Is this the material that's coming out of the geothermal power plants, or is there something coming out of the lithium that's going to be an added waste stream to that?”	Hazardous Waste and Materials	Hazardous Waste: Featherstone, J. L., Hanson, P. J., Garska, M. J., & Marston, C. R. (2020). Process for Recovery of Lithium From a Geothermal Brine (Patent US20200189925A1). Hazardous Waste: Chambers Group, Inc. (2021). Draft Environmental Impact Report for the Energy Source Mineral ATLiS Project.

2	Calipatria	“But my question is a little bit more simplistic and it has to do with the environment…We have the refuge… how is this all going to impact that area?”	Salton Sea Degradation	Salton Sea Degradation: Salton Sea Management Program. (2022). Salton Sea Long Range Plan Public Draft. California Natural Resources Agency.
3	Calipatria	“...if your county only gets so much water, the north end of us, we only get a percentage of that. There's far more farming. What's going to happen to that land?…And any of this water that's also being used in the plants… it's going to be filtered and sent down to the solvency as a replacement?”	Fresh water consumption	Thrash, M. E., & Hanlon, J. W. (2019). Southern California water politics at the Salton Sea: When “increased efficiency” is not enough. Case Studies in the Environment, 3(1), 1–6. Vera, M. L., Torres, W. R., Galli, C. I., Chagnes, A., & Flexer, V. (2023). Environmental impact of direct lithium extraction from brines. Nature Reviews Earth & Environment, 4(3), 149–165. https://doi.org/10.1038/s43017-022-00387-5
4	Calexico	“Que me digan exactamente cómo está mi tierra, que me digan exactamente hasta dónde la geotérmica me va a perjudicar la tierra y me va a traer problemas de tal manera que voy a tener temblores…Necesitamos primeramente conocer el impacto ambiental de todo el condado del Valle Imperial.”	Seismic Activity	Seismic Activity: Woo, J.-U., Kim, M., Sheen, D.-H., Kang, T.-S., Rhie, J., Grigoli, F., Ellsworth, W. L., & Giardini, D. (2019).An In-Depth Seismological Analysis Revealing a Causal Link Between the 2017 MW 5.5 Pohang Earthquake and EGSProject. Journal of Geophysical Research: Solid Earth, 124(12), 13060–13078.
5	Calexico	“Hay muchos niños con asma. ¿Qué es lo que piensan hacer?” Hay 22% de nuestros niños que tienen asma…Por las partículas finas de la arena que se levantan muchos de las personas que tienen asma van a tener asma	Air quality	California Department of Public Health. (n.d.). CHIS Data-Current Asthma Prevalence by County. California Health and Human Services Open Data Portal. Retrieved June 28, 2023, from https://data.chhs.ca.gov/dataset/

		crónica.		asthma-prevalence/resource/a440b99b-ccc6-473c-bea1-2baf36b05dbe Farzan, S. F., Razafy, M., Eckel, S. P., Olmedo, L., Bejarano, E., & Johnston, J. E. (2019). Assessment of Respiratory Health Symptoms and Asthma in Children near a Drying Saline Lake. International Journal of Environmental Research and Public Health, 16(20), Article 20. https://doi.org/10.3390/ijerph16203828
6	Calexico	"What will happen in the case of a leakage of Lithium into the waterways and earth. Would it be deadly?"	Freshwater Consumption, Hazardous Waste	Chambers Group, Inc. (2021). Draft Environmental Impact Report for the Energy Source Mineral ATLiS Project. County of Imperial Planning & Development Services Department. (2022). Initial Study & Environmental Analysis For: Hell's Kitchen PowerCo 1 and LithiumCo 1 Project. (Look at Page E30)
7	Calexico	"Is there a plan for preventing wildfires around the plant?"	Wildfires	Kong, L., Li, C., Jiang, J., & Pecht, M. (2018). Li-Ion Battery Fire Hazards and Safety Strategies. Energies, 11(9), 2191.
8	Calexico	"What measures are being taken to avoid liquefaction once the lithium is extracted?"	Seismic Activity	Chambers Group, Inc. (2021). Draft Environmental Impact Report for the Energy Source Mineral ATLiS Project. County of Imperial Planning & Development Services Department. (2022). Initial Study & Environmental

				Analysis For: Hell's Kitchen PowerCo 1 and LithiumCo 1 Project. (Look at page E28-29)
9	Ocotillo	"Well, I'm just wondering if it talks about air pollution. My first thought was "how much is that going to go across the fields and contaminate all the food that's being raised out here?"	Air Quality	Maizlish, N., English, D., Chan, J., Dervin, K., & English, P. (2017). Climate Change and Health Profile Report: Imperial County. Office of Health Equity, California Department of Public Health. https://scag.ca.gov/sites/main/files/file-attachments/chpr025imperial_county2-23-17.pdf?1604524054
10	Ocotillo	"Our wind is from the northwest, so it's going towards the valley. But in Santa Anas, I think it goes the opposite way. So we're going to be polluted too, right there at the top of-"	Air Quality	Mandatory GHG Reporting - Reported Emissions https://ww2.arb.ca.gov/mrr-data
11	Ocotillo	"I have a friend who got the information from the source of one of the geothermal companies…some of the geothermal brines and muds that were… being spread on dirt roads for dust suppression… is anyone talking about low level radioactive materials?"	Hazardous Waste & Materials	Hazardous Waste: Chambers Group, Inc. (2021). Draft Environmental Impact Report for the Energy Source Mineral ATLiS Project.
12	Ocotillo	"I was talking to the lithium battery expert, I said, "So in case of fire, is our local Cal fire department equipped to fight a fire and do they have the equipment to fight the fire?""	Fires, Air quality	Characterizing the Geothermal Lithium Resource at the Salton Sea (2023) https://escholarship.org/uc/item/4x8868mf
13	Westmorland	"So how does that add up when you plan to build all these warehouses but you also have the lithium companies or the Lithium	Freshwater, Water Consumption	Water consumption: Paz, S., Kelley, R., Castaneda, S., Colwell, R., Dolega, R., Flores, M., Hanks, J., Lopez, A., Olmedo, L.,

		Valley Commission saying they're planning to use more water than what's available?"		Reynolds, A., Scott, M., Soto, T., & Weisgall, J. (2022). Report of the Blue Ribbon Commission on Lithium Extraction in California (CEC-300-2022-009-F). California Energy Commission.
14	Westmorland	"You say that arsenic and lead and possibly some, who knows, toxic sludge can be exhumed. What are the precautions that would be taken for the employees at a site where these things are being excavated?"	Hazardous Waste and Minerals	Vera, M. L., Torres, W. R., Galli, C. I., Chagnes, A., & Flexer, V. (2023). Environmental impact of direct lithium extraction from brines. Nature Reviews Earth & Environment, 4(3), 149–165.
15	Westmorland	So in case of fire, is our local Cal fire department equipped to fight a fire and do they have the equipment to fight the fire?"	Wildfires	Kong, L., Li, C., Jiang, J., & Pecht, M. (2018). Li-Ion Battery Fire Hazards and Safety Strategies. Energies, 11(9), 2191.
16	Westmorland	"...Other different projects you see, they leave, they just leave everything behind and we end up cleaning the dirty dishes, meaning the community. Have you heard anything like an exit plan or anything about it?"	Hazardous Waste and Materials	Featherstone, J. L., Hanson, P. J., Garska, M. J., & Marston, C. R. (2020). Process for Recovery of Lithium from a Geothermal Brine (U.S. Patent Office Patent No. 10604414). In Patent (No. 10604414). https://patents.justia.com/patent/20200189925

From: James BClutch
To: Jim Minnick
Subject: Re: Imperial County's Program Environmental Impact Review for the Lithium Valley Specific Plan
Date: Monday, February 19, 2024 9:22:01 AM

February, 19th, 2024
Jim Minnick
801 Main Street
El Centro, CA 92243
Re: Imperial County's Program Environmental Impact Review for the Lithium Valley Specific Plan

Dear Mr. Jim Minnick,
On behalf of myself, James Bruschi, resident of Bombay Beach, I am pleased to offer scoping comments for
Imperial County's Program Environmental Impact Report (PEIR) for the proposed Lithium Valley Specific Plan Project (Project) (SP22-0001). We understand that the Lithium Valley Specific Plan and PEIR is intended to provide a framework and guidance for the necessary infrastructure and facilities and streamline the development and permitting of additional renewable energy facilities, mineral recovery, lithium battery manufacturing, and other renewable industries within an approximately 51,786-acre area adjacent to the Salton Sea. Currently, the Imperial County Planning & Development Services Department is seeking the community's comments about the effects this project might have on the environment and suggestions as to alternatives, mitigation or ways the project may be revised to reduce or avoid any significant environmental impacts.

I, James Bruschi, would like to recommend that the following topics be analyzed in the PEIR:
Aesthetics
Agriculture and Forestry Resources
Air Quality
Biological Resources
Cultural Resources
Cumulative Effects
Drainage/Absorption
Geology/Soils
Hazards & Hazardous Materials
Hydrology/Water Quality
Land Use/Planning
Mineral Resources
Noise
Population/Housing
Public Services
Recreation
Schools/Universities
Septic System
Sewer Capacity
Solid Waste
Transportation

Vegetation
Wetland/Riparian
Wildfire
The future levels of the Salton Sea body of water
The long term plan to prevent stranded infrastructure
Overall project cleanup agenda
Making sure that cleanup costs don't fall upon the town/county/state people and taxpayers
The companies involved will be held responsible for any environmental disaster, no matter how big or how small.

These topics listed above are of great concern because of the environmental impact that it will have on myself, my property, and the surrounding community, be it direct, indirect, or cumulative impacts. The analysis should consider the impacts of these topics because of the importance of the impact on the geography, and affected populations within Imperial County. Thank you for taking the time to consider my suggested topics for analysis. I am looking forward to seeing my comments reflected in the draft of the Programmatic Environmental Impact Review
for the Lithium Valley Specific Plan.

Best regards,
James Bruschi
Resident of Bombay Beach, CA

Keegan Kingsbury

From: james hatchett <hatchett-james@sbcglobal.net>
Sent: Monday, February 12, 2024 3:46 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

This analysis should carefully consider cumulative impacts on the entire Imperial County Air Pollution Control District, which is already severely degraded. Any worsening air quality would significantly impact public health and likely exceed legal thresholds, which must be analyzed and mitigated. Given these concerns, please consider a project alternative requiring no reduced inflow to the Salton Sea.

Thank you.

Sincerely,
james hatchett
18606 Keswick St
Reseda, CA 91335

Keegan Kingsbury

From: James Monroe <randy@monroescienceed.com>
Sent: Monday, February 12, 2024 1:28 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

This analysis should carefully consider cumulative impacts on the entire Imperial County Air Pollution Control District, which is already severely degraded. Any worsening air quality would significantly impact public health and likely exceed legal thresholds, which must be analyzed and mitigated. Given these concerns, please consider a project alternative requiring no reduced inflow to the Salton Sea.

Thank you.

Sincerely,
James Monroe
5521 Michigan Blvd
Concord, CA 94521

February 19, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Aesthetics, Agriculture and Forestry, Air Quality / Calidad de aire, Biological Resources, Cultural resources, Cumulative Effects, Drainage/Absorption, Geology/Soils, Hazards and Hazardous Materials, Hydrology/Water Quality, Land Use/Planning, Mineral Resources, Noise, Population/Housing, Public Services, Recreation, Schools/Universities, Septic System, Sewer Capacity/Solid Waste, Transportation, Vegetation, Wetland/Riparian, Wildfire, Other
Resident Name: Janenne Willis
Resident City/Town: Bombay Beach

Scoping Comments:

Hi there,

I am a frequent visitor to Bombay Beach and have a number of questions regarding the impact of the proposed lithium extraction from the Salton Sea. This is a profoundly environmentally significant area for humans and nature alike. The importance of the community having access to transparent and accurate information in all of the areas I have outlined below is paramount…

Environmental Impact:
a. What are the potential environmental impacts of the proposed lithium extraction process, particularly in terms of water usage and pollution? Particularly, how will this project alleviate the all critical receding Salton Sea issue?
b. How will the project mitigate any potential environmental harm, and are there any alternative methods of lithium extraction that have been considered?
c. What are the potential impacts on local wildlife and habitats, including the Salton Sea itself?

d. What steps will be taken to ensure the long-term sustainability and health of the region's ecosystem?
Economic Impact:
a. How many jobs will be created by the project, and what types of jobs are they?
b. What will be the project's contribution to the local economy in terms of tax revenue, infrastructure development, and other economic benefits?
c. How will the project affect property values and the cost of living in the area?
d. How will the project benefit the local community, and what measures are in place to ensure that these benefits are realized?
Technological Feasibility:
a. What is the proposed method for extracting lithium from the Salton Sea, and has this method been tested and proven effective elsewhere?
b. What are the potential technical challenges of the project, and how will they be addressed?
c. Are there any risks associated with the proposed technology, and what measures are in place to mitigate these risks?
d. What is the estimated lifespan of the project, and how will it be decommissioned once it reaches the end of its life cycle?
Social Implications:
a. How will the project affect the local communities living around the Salton Sea edges, including residents, businesses, and other stakeholders?
b. What steps will be taken to address any potential negative social impacts, such as displacement of residents or disruption of local traditions?
c. How will the project affect the region's cultural heritage and identity?
d. What measures are in place to ensure that the project respects the rights and interests of indigenous communities in the area? Have the Torrez Martinez Cahuillan people been consulted deeply and how will they be involved from here?
Other Considerations:
a. What are the potential long-term benefits and drawbacks of the project, and how do these compare to other alternatives?
b. Are there any regulatory or legal challenges that the project may face, and how will these be addressed?
c. How will the project contribute to global efforts to transition to a more sustainable energy future?
d. What are the potential risks of the project, and how will these be managed?
These are just some of the many questions that I could ask. I’m sure more detailed questions will unfold as more information comes to hand.

Thank you, Janenne

Keegan Kingsbury

From: Javier Del Valle <jdelvalle@dvacommercialre.com>
Sent: Monday, February 12, 2024 10:24 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

This analysis should carefully consider cumulative impacts on the entire Imperial County Air Pollution Control District, which is already severely degraded. Any worsening air quality would significantly impact public health and likely exceed legal thresholds, which must be analyzed and mitigated. Given these concerns, please consider a project alternative requiring no reduced inflow to the Salton Sea.

Thank you.

Sincerely,
Javier Del Valle
PO Box 3060
Montebello, CA 90640

February 19, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Aesthetics, Agriculture and Forestry, Air Quality, Biological Resources, Cumulative Effects, Drainage/Absorption, Geology/Soils, Hazards and Hazardous Materials, Hydrology/Water Quality, Noise, Transportation, Vegetation, Wetland/Riparian, Wildfire
Resident Name: Jeff Frost
Resident City/Town: Bombay Beach

Scoping Comments:
Hello, I am a part time Bombay Beach resident. I am concerned with how this project will impact the environment for the communities that live around the Salton Sea. How will this affect the water table, air quality, and soil? What effect will the extraction of lithium have on the soil? What might wind up seeping into the Salton Sea itself? Etc.

Keegan Kingsbury

From: Jerry Horner <j_horner@u.pacific.edu>
Sent: Monday, February 12, 2024 1:13 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

This analysis should carefully consider cumulative impacts on the entire Imperial County Air Pollution Control District, which is already severely degraded. Any worsening air quality would significantly impact public health and likely exceed legal thresholds, which must be analyzed and mitigated. Given these concerns, please consider a project alternative requiring no reduced inflow to the Salton Sea.

Thank you.

Sincerely,
Jerry Horner
727 Navaronne Way
Concord, CA 94518

Keegan Kingsbury

From: Jim Minnick <JimMinnick@co.imperial.ca.us>
Sent: Tuesday, February 20, 2024 8:07 AM
To: j m
Cc: Matthew Valerio; Michael Abraham; Diana Robinson; Rebecca Terrazas-Baxter
Subject: RE: Imperial County's Program Environmental Impact Review for the Lithium Valley Specific Plan

Mr. Mullen,

Thank you for the email. The email will be sent to the county's consultant tasked with preparing the Programmatic Environmental Impact Report.

Jim Minnick
Director
ICPDS

801 Main Street
El Centro, CA 92243
(442)-265-1736
jimminnick@co.imperial.ca.us

From: j m <relaxandlaugh@gmail.com>
Sent: Tuesday, February 20, 2024 7:48 AM
To: Jim Minnick <JimMinnick@co.imperial.ca.us>
Subject: Imperial County's Program Environmental Impact Review for the Lithium Valley Specific Plan

February, 20th, 2024
Jim Minnick
801 Main Street
El Centro, CA 92243
Re: Imperial County's Program Environmental Impact Review for the Lithium Valley Specific Plan

Dear Mr. Jim Minnick,
My name is Jess Mullen and I'm a property tax-paying resident of Bombay Beach. I'm commenting today to strongly encourage that ALL potential impacts of lithium mining in Imperial County be studied and reported on by an unbiased 3rd party validator, in addition to or in conjunction with the Programmatic Environmental Impact Report.

Communities living along the Salton Sea, and in Imperial County-- California's poorest, already experience the environmental injustice of toxic air pollution from Salton Sea dust and industrial agriculture. It's essential that each potential impact of lithium mining be looked at through an intersectional lense. The transition off of fossil fuel to renewables and batteries must be JUST, EQUITABLE, and INCLUSIVE. This means that communities living adjacent to climate solutions cannot be dismissed as sacrifice zones that continue to bear the brunt of negative health impacts.

Water usage is also an alarming aspect of lithium mining. Some of the world's most profitable companies have their eyes set on our area because of its lucrative resources. Any company looking to mine for lithium should be required to

produce a plan that provides the water it needs at its own expense, from its own source, NOT from the Colorado River, and not from the shrinking Salton Sea itself. The people of Imperial Valley will tolerate public risk for private gain, and this includes maintaining water supply for both ourselves and flourishing wildlife.

Other logistical issues that are crucial to be examined are housing supply, traffic (both safety and the increased air pollution from it), and what is required of companies when they decide to terminate their operations. The last thing our communities need is another stranded asset when the Salton Sea no longer benefits an industry.

I would like to recommend that the following topics be analyzed in the PEIR:
Aesthetics
Agriculture and Forestry Resources
Air Quality
Biological Resources
Cultural Resources
Cumulative Effects
Drainage/Absorption
Geology/Soils
Hazards & Hazardous Materials
Hydrology/Water Quality
Land Use/Planning
Mineral Resources
Noise
Population/Housing
Public Services
Recreation
Schools/Universities
Septic System
Sewer Capacity
Solid Waste
Transportation
Vegetation
Wetland/Riparian
Wildfire

Thank you for your time and consideration,
Jess Mullen

February 20, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Aesthetics, Agriculture and Forestry, Air Quality, Biological Resources, Cultural resources, Cumulative Effects, Drainage/Absorption, Geology/Soils, Hazards and Hazardous Materials, Hydrology/Water Quality, Land Use/Planning, Mineral Resources, Noise, Population/Housing, Public Services, Recreation, Schools/Universities, Septic System, Sewer Capacity/Solid Waste, Transportation, Vegetation, Wetland/Riparian, Wildfire, Other
Resident Name: Jess Mullen
Resident City/Town: Bombay Beach

Scoping Comments:
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Other logistical issues that are crucial to be examined are housing supply, traffic (both safety and the increased air pollution from it), and what is required of companies when they decide to terminate their operations. The last thing our communities need is another stranded asset when the Salton Sea no longer benefits an industry.

I recommend that the following topics be analyzed in the PEIR: Aesthetics, Agriculture and Forestry Resources, Air QualityBiological Resources, Cultural Resources, Cumulative Effects, Drainage/ Absorption, Geology/Soils, Hazards & Hazardous Materials, Hydrology/Water Quality, Land Use/Planning, Mineral Resources, Noise, Population/Housing, Public Services, RecreationSchools/Universities, Septic System, Sewer Capacity, Solid Waste, Transportation, Vegetation, Wetland/Riparian, Wildfire

Thank you for your time and consideration,
Jess Mullen

Keegan Kingsbury

From: Jesse Rivas <Jess.Rivas@outlook.com>
Sent: Sunday, February 18, 2024 5:16 PM
To: Jim Minnick
Subject: Lithium Valley Health and Safety

Hello To Whom it Concern,

My Family and I have been a residents of Calipatria Ca. for 63 years and have some open-ended questions about the lithium extraction.

For the acres required for the lithium plants is their hazardous material runoff? Are there any lined Ponds to capture any material that would leech off? If so, will the ponds have any dry well testing outside of the liner. Lab personnel to test and report any abnormalities.
During a rain, will the facilities capture 100% of the rain that could come in contact with process chemicals? What would be done with the fluid?

I know that the geothermal facilities have hazardous and non-hazardous waste, H2S that must be buried off. Will the lithium have any hazardous non-hazardous waste? Process resins that need to be changed out and discarded.
As part of the lithium project in the imperial valley require lithium plating, anode/cathode
With this process, emit acid fumes into the atmosphere.

Of the three main companies that are proposing lithium extraction. Is there an option to sell Brine to a lithium extraction third-party
If there is any breakdown in the process, will they have to turn in notification today APCD?

I am not apposed to seeing the Imperial Valley Prosper, we just need to make every effort to consider the effects of all young and old residents.

Thank You
Jesse Rivas

February 19, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Aesthetics, Agriculture and Forestry, Air Quality, Biological Resources, Cultural resources, Cumulative Effects, Drainage/Absorption, Geology/Soils, Hazards and Hazardous Materials, Hydrology/Water Quality, Land Use/Planning, Mineral Resources, Noise, Public Services, Recreation, Schools/Universities, Septic System, Sewer Capacity/Solid Waste, Transportation, Vegetation, Wetland/Riparian
Resident Name: Joel Arellano
Resident City/Town: Bombay Beach

Scoping Comments:
I'm writing because I enjoy and appreciate the Bombay Beach community. I want to ensure we don't subject the community to another round of devastating environmental, economic, and individual health consequences.

Keegan Kingsbury

From: Johanna Espinoza <espinoza.johanna99@gmail.com>
Sent: Monday, February 19, 2024 10:03 PM
To: Jim Minnick
Subject: Lithium Specific Plan Environmental Concern Public Comment

Dear Mr. Minnick

My name is Johanna Espinoza, I am a resident of El Centro and an educator in Calexico. I am writing because the Imperial Valley has been my home for all 24 years of my life. I am worried for the future of our communities and the Earth. In national and worldwide news, history books and media, I have seen time and time again the same story repeat itself. A natural resource gets "discovered" in a small community and it is depleted by outside companies. Disaster is left behind, people get ill and so does the plant and animal life.

Upon reading the Berkeley Lab Project Report many things caught my attention but I am most worried about the hazardous waste that will be "recycled" to "avoid overflowing the landfills". I am concerned about the parameters used to define what is hazardous and what is not. I hope that these recycled materials will not be in direct contact with our incorporated or unincorporated residents in the Imperial Valley. I urge for transparency with any trace of radioactivity that may be found in waste to be explicitly and clearly announced to the public eye.

I've also read about how the injection of brine is connected to seismic activity. I am concerned for our future due to the proximity of the San Andreas fault to our area. I suggest that the projected impacts are projected for as far ahead as 60-100 years, if possible. Also I ask that the correlation between the magnitude of the seismic activity and the quantity/rate of extraction be studied in order to mitigate the damage to our community's infrastructure and housing that is caused every time we get earthquakes.

I am conscious that construction and even some extraction has already begun but in light of a lot of the information found in studies and reports about Lithium extraction in other sites, I recommend that the project does not proceed. I value life over profit and no amount of money or development will be enough to cover up for sickness, disrupted nature and death.

Johanna Espinoza (she/her, they/them)
760-222-7397
espinoza.johanna99@gmail.com

Keegan Kingsbury

From: Johnna Edmunds <edmunds@sonoma.edu>
Sent: Monday, February 12, 2024 2:07 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

This analysis should carefully consider cumulative impacts on the entire Imperial County Air Pollution Control District, which is already severely degraded. Any worsening air quality would significantly impact public health and likely exceed legal thresholds, which must be analyzed and mitigated. Given these concerns, please consider a project alternative requiring no reduced inflow to the Salton Sea.

Thank you.

Sincerely,
Johnna Edmunds
3435 Sonoma Mountain Road
PETALUMA, CA 94954

February 20, 2024

Jim Minnick, Director
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

RE: TOPICS TO CONSIDER FOR THE NOTICE OF PREPARATION OF DRAFT PROGRAM EIR FOR THE LITHIUM VALLEY SPECIFIC PLAN

Dear Director Minnick:

My name is Theo Figurasin, and I am a Senior Researcher with Jobs to Move America (JMA). My organization is a strategic policy center seeking to advance a fair and prosperous economy with good jobs and healthier environments for all. We aim to harness the power of our public dollars to ensure it does the most public good for communities across the country. Lithium Valley is a once-in-a-lifetime opportunity to transition the United States to a green economy, but the Imperial County communities should not be left behind.

In Imperial County, JMA is working in coalition with labor and environmental groups to ensure that the community benefits from the proposed and future lithium projects without causing harm to the environment, the surrounding residents, and the current and future workers in the Lithium Valley industries. Thus, JMA asks Imperial County to study the following topics:

Air Quality. Please study the cumulative impact on air quality from the construction and operation of the proposed lithium developments. Imperial County continues to experience high levels of air pollution and has the state's highest rates of asthma hospitalization. The current lithium projects may likely lead to the construction and operation of future lithium, lithium supply chain manufacturing, heavy metal, and other renewable energy projects. It is also reasonably foreseeable that without proper mitigation and investment into Salton Sea restoration, dust from exposed playa may further degrade air quality. Thus, the analysis should include additive impacts on air quality from potential build-out.

Please also consider alternatives and mitigation that would result in no or drastically reduced emissions of particulate matter, greenhouse gasses, and hydrogen chloride. Consider common-sense mitigation measures, such as mandating the use of heavy-duty electric vehicles for the construction and operations phases of projects. Also, consider Salton Sea restoration as a mitigation measure to reduce the negative air quality impacts from exposed dry bed playa.

Waste and Materials. With Controlled Thermal Resources and BHE Renewables additional projects, there will be a total of fifteen total geothermal and direct lithium extraction sites. There is also the possibility of the potential of co-location of industries in the lithium supply chain. Thus, hazardous and non-hazardous waste and materials must be studied thoroughly. Please study the hazardous and non-hazardous waste and materials generated by geothermal power generation and direct lithium extraction. According to the EnergySource Minerals Environmental Impact Report (EIR), they expect to create 37,602 cubic yards of non-hazardous waste and 4,178 cubic yards of hazardous waste for their project alone.[1] This analysis should also include responsible waste management. Please consider mitigation that minimizes or recycles waste. Additionally, consider mitigation measures that do not rely on neighboring states with health, safety, and environmental regulations comparatively lower than California.

Freshwater Consumption. Please study the cumulative freshwater consumption of the proposed and future geothermal and commercial-scale direct lithium extraction projects. The analysis should consider how freshwater consumption in the Specific Plan Area will impact the Salton Sea, wildlife, and agriculture. Additionally, the analysis should include scenarios of drought and reduced Colorado River water allocation. Please consider mitigation to conserve freshwater.

Tribal and Cultural Resources. Please study and consider the impact on Tribal and Cultural Resources of potential Lithium Valley projects. Land and the geographical landscape should be thoroughly surveyed for Tribal cultural resources. Tribes also have different spiritual connections to the Salton Sea that must be studied. Please follow AB 52 requires that tribes be consulted during the CEQA process and consultation should include each tribe's cultural committee, or equivalent. Please explain your methodology of outreach, the extent of consultation, and any mitigation measures.

Air Quality, Waste and Materials, and Freshwater Consumption are topics discussed in Comite Civico Del Valle, Inc. and Earthworks' recent report, Environmental Justice in California's Lithium Valley, and we strongly urge you to read it carefully.[2] For the topic of Tribal and Cultural Resources, we strongly urge you to conduct extensive outreach and meetings with the impacted groups such as the Quechan Indian Tribe, Torres Martinez Desert Cahuilla Indians, and others.

---

[1] Chambers Group. (2021, June). *DRAFT ENVIRONMENTAL IMPACT REPORT FOR THE ENERGY SOURCE MINERAL ATLIS PROJECT IMPERIAL COUNTY, CALIFORNIA*. https://www.icpds.com/assets/Energy-Source-Mineral-ATLiS-Project-DEIR-.pdf

[2] Naimark, Jared. (2023, November). *Environmental Justice in California's Lithium Valley*. Earthworks.org https://earthworks.org/wp-content/uploads/2023/10/California-Lithium-Valley-Report.pdf

Thank you for your attention on these listed topics. Please do not hesitate to contact me with any additional questions or concerns.

Thank you,

Theo Figurasin
Senior Researcher
Jobs to Move America

February 19, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Air Quality, Biological Resources, Cumulative Effects, Drainage/Absorption, Geology/Soils, Hazards and Hazardous Materials, Hydrology/Water Quality
Resident Name: Judyth Greenburgh
Resident City/Town: Owen's Valley

Scoping Comments:
I am from the Owen's Valley where the Owen's lake was sucked dry by LADWP creating a dust bowl that no mitigation has stopped. LADWP was sued and are currently paying billions of dollars to resolve the problem with no avail. It has been an environmental disaster. They are the future you do not want to become - the Salton Sea is much larger making more of an impact. Don't make the same mistake! Leave the water there! If you want some hard data around this I can introduce you to people.

Keegan Kingsbury

From: Julie Kanoff <jkanoff@sbcglobal.net>
Sent: Monday, February 12, 2024 5:46 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

This analysis should carefully consider cumulative impacts on the entire Imperial County Air Pollution Control District, which is already severely degraded. Any worsening air quality would significantly impact public health and likely exceed legal thresholds, which must be analyzed and mitigated. Given these concerns, please consider a project alternative requiring no reduced inflow to the Salton Sea.

Thank you.

Sincerely,
Julie Kanoff
407 Meister Way
Sacramento, CA 95819

From: Jim Minnick
To: Diana Robinson; Michael Abraham; Matthew Valerio; Brian Mooney; Shannon Baer
Subject: FW: Lithium Valley Scoping Meeting
Date: Wednesday, December 13, 2023 4:04:37 PM

FYI

From: Gamboa-Arce, Justina <jgamboaarce@IID.com>
Sent: Wednesday, December 13, 2023 3:26 PM
To: Jim Minnick <JimMinnick@co.imperial.ca.us>
Cc: David Black <DavidBlack@co.imperial.ca.us>
Subject: Lithium Valley Scoping Meeting

Hello Jim,

I am unable to attend the Scoping Meeting For Lithium Valley SPA tomorrow

Below are some preliminary comments. Thank you for the opportunity to comment.

Water Facilities-Among other things, the Specific Plan should assess the direct, indirect and cumulative potential impacts on the environment of using currently available water supplies and/or conserved water for new industrial, municipal, commercial and/or institutional uses instead of the historical use of that water for agriculture. Such a change in land use, and the associated water use, could potentially impact land uses, various aquatic and terrestrial species, water quality, air quality and the conditions of drains, rivers and the Salton Sea. The Draft EIR should address the following:

1. **Water Supply Policy** – IID's Interim Water Supply Policy currently designates up to 25,000 AFY of water for conservation for potential Non-Agricultural Projects within IID's water service area. As of December 12, 2023, Imperial County has issued land use entitlements to numerous non-agricultural developments within their jurisdiction in volumes that exceed the 25,000 AFY that has been set aside by IID for conservation. The Draft EIR will need to independently assess the project's impacts to IID's available water supply and/or additional conservation actions to augment supplies.
2. **Land Use Plans/SPA's Water Assessment**– Imperial County should ensure that the water supply component of their respective planning document is comprehensive and based upon current information. Among other things, the SPA should assess the direct, indirect and cumulative potential impacts on the environment of using currently available water supplies and/or conserved water for new industrial, municipal, commercial and/or institutional uses instead of the historical use of that water for agriculture. Such a change in land use, and the associated water use, could potentially impact land uses, various aquatic and

terrestrial species, water quality, air quality and the conditions of drains, rivers and the Salton Sea.

3. **Water Infrastructure Access Limitations** - Over 33% of the acreage within the SPA does not have a lateral canal immediately accessible for water delivery. Development of the SPA may necessitate the extension of water distribution infrastructure into some of the planned development areas. Impacts would need to be assessed under a programmatic EIR
4. **Canal System Capacity** - The capacity of the canal system within the SPA is limited and already runs at maximum capacity during certain times of the year. Accommodating a water supply above current demands would necessitate substantial water infrastructure modifications, which may include, but not be limited to, a new canal, existing lateral enlargement, culvert replacements, intertie construction, regional water storage pond(s).
5. **Drain Infrastructure Access Limitations** - Over 25% of the acreage within the SPA does not have a drain immediately accessible for drain water collection. Development of the SPA may necessitate the extension of drainage into some of the planned development areas. Impacts would need to be assessed under a programmatic EIR, particularly as it relates to impacts to biological resources.
6. **Impacts to the Salton Sea from Drain Flow Reduction** – In general, industrial/commercial land uses are not allowed to discharge directly into IID drains. As such, 100 percent (100%) of the water supply demand for the project is anticipated to result in a permanent, annual, net reduction of flow to the Salton Sea. Loss of flow to the Salton Sea impacts numerous biological resources and creates air quality impacts from receding shoreline. "The impacts to the Salton Sea, due to loss or reduction of agricultural runoff caused by agricultural land conversion to urban use shall be discussed in the document. Due to the potential loss or reduction of inflow to the Salton Sea and to IID drains with its concurrent environmental impacts, developer should address this issue as well as provide analysis that the project does not negatively impact the IID Water Conservation and Transfer Draft Habitat Conservation Plan (HCP), the existing Section 7 Biological Opinion and the California Endangered Species Act (CESA) Permit 2081.

   An assessment or discussion of cumulative impacts considering other non-agricultural facilities whose water use (or potential water use) would reduce the inflow conveyed to IID drains and the Salton Sea is necessary. It is advisable that project proponent present a cumulative impact analysis on inflow to IID drains and the Salton Sea.

   The following are access links to the documents mentioned:

   - The HCP is part of the IID Water Conservation and Transfer Project, Final EIR/EIS and can be found at Water/Library/QSA-Water-Transfer/Environmenta-Assessment/Permits/Final EIREIS; Volume II, Appendix A Species Covered by the HCP. The HCP in the Draft EIR/EIS may contain small changes from the final version of the EIR/EIS. It is in a different appendix in the draft that the final EIR/EIS (Appendix C).

Until the final HCP/Natural Community Conservation Plan is approved, IID uses the draft HCP in the draft document, which can be accessed at Water/Library/QSA-Water-Transfer/Environmental-Assessment).

- The Biological Opinion (federal ESA permit) is at https://www.iid.com/Imperial-Irrigation-District/Salton-Sea-Areas.
- The CESA 2081 (the water transfer operates under this state ESA permit until the NCCP is approved) can be found at https://www.iid.com/water/library/qsa-water-transfer/environmental-assessments-permits/cesa-compliance.
- The MMRP (Mitigation Monitoring and Report Program) is at https://www.iid.com/Water/Library/QSA-Water-Transfer/Mitigation.

Please don't hesitate to contact me if I can assist with any data.

Best Regards,

Justina Gamboa-Arce
Justina Gamboa Arce
Senior Water Resources Planner
760.339.9085 cell: 760.791.1888
<image001.png>

"Never put off till tomorrow what you can do today." —Thomas Jefferson

Keegan Kingsbury

From: Karen Hellwig <khellwigrn@sbcglobal.net>
Sent: Monday, February 12, 2024 2:26 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

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Thank you.

Sincerely,
Karen Hellwig
6266 Morley Ave
Los Angeles, CA 90056

February 19, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Agriculture and Forestry, Air Quality, Biological Resources, Cultural resources, Hazards and Hazardous Materials, Hydrology/Water Quality, Land Use/Planning, Mineral Resources, Population/Housing, Recreation, Schools/Universities, Vegetation, Wildfire
Resident Name: Karla D. Alvarez
Resident City/Town: Calexico

Scoping Comments:
I am a Calexico resident and have always had concerns since resources to our valley are always at risk and there is always worry about our resources such as water through the Colorado river being taken away, agriculture stopping due to more housing etc. To my knowledge, the saltón sea, close by factories in Mexicali and the New river have contributed to the low quality air in the imperial valley community. Will this new project contribute to worsening our air quality? Does this project affect the agriculture/vegetation of our valley in a way that may cause a reduction in agricultural job opportunities? Is there a chance that the residue/ aftermath/excavation will cause dangerous chemicals to pollute our sources of water and our air quality? Will there be traffic delays due to machinery moving around causing traffic? If so for how long?

What benefits will the imperial valley receive from this project?

February 20, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Aesthetics, Agriculture and Forestry, Air Quality, Biological Resources, Cultural resources, Cumulative Effects, Drainage/Absorption, Geology/Soils, Hazards and Hazardous Materials, Hydrology/Water Quality, Land Use/Planning, Mineral Resources, Noise, Population/Housing, Public Services, Recreation, Schools/Universities, Septic System, Sewer Capacity/Solid Waste, Transportation, Vegetation, Wetland/Riparian, Wildfire

Resident Name: Kate Calderwood

Scoping Comments:

I am a resident of Imperial County and want to preserve the area's current environmental state and improve it. I am a former County Planner and architectural designer.

No action alternative where the project isn’t permitted

February 19, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Agriculture and Forestry, Air Quality, Biological Resources, Cultural resources, Hazards and Hazardous Materials, Hydrology/Water Quality, Land Use/Planning, Mineral Resources, Population/Housing, Recreation, Schools/Universities, Vegetation, Wildfire
Resident Name: Karla D. Alvarez
Resident City/Town: Calexico

Scoping Comments:
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What benefits will the imperial valley receive from this project?

Keegan Kingsbury

From: Kenneth Miller <ken@kennethmiller.net>
Sent: Monday, February 12, 2024 1:37 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

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Thank you.

Sincerely,
Kenneth Miller
21217 Bellini Dr
Topanga, CA 90290

COURTNEY ANN COYLE
ATTORNEY AT LAW

HELD-PALMER HOUSE
1609 SOLEDAD AVENUE
LA JOLLA, CA USA 92037-3817

TELEPHONE: 858-454-8687 E-MAIL: COURTCOYLE@AOL.COM FACSIMILE: 858-454-8493

Jim Minnick, Director
Planning & Development Services Department
Via email: JimMinnick@co.imperial.ca.us

February 20, 2024

Re: Kwaaymii Laguna Comments on
Notice of Preparation of and Initial Study for a Draft Program EIR
for the Lithium Valley Specific Plan

Dear Director Minnink,

These comments on the Notice of Preparation (NOP) and Initial Study (IS) for the Draft Program EIR (PEIR) for the Lithium Valley Specific Plan (Project or Plan), are timely submitted on behalf of Carmen Lucas, Kwaaymii Laguna Band of Indians. Ms. Lucas's cultural affiliation to the Project area and tribal cultural resource expertise are outlined in **Exhibit 1**. We commend the County for its efforts to comprehensively plan the development that may be sited in this area.

The NOP says the County would like to know ideas about Project effects on the environment, suggestions as to alternatives, mitigation, or ways the Project may be revised to reduce or avoid any significant environmental impacts (NOP, page 2). Ms. Lucas is concerned that both the NOP and the IS are incomplete, as they do not adequately or correctly address tribal cultural resources or other tribal concerns regarding the proposed Project. She is also deeply concerned that the County continues to ignore evidence provided by her and other tribal entities regarding the Southeast Lake Cahuilla Active Volcanic Cultural District and not consult with her as is required under SB 18, AB 52, and other authority.

Sensitive Project Setting Ignored

First, the NOP states (NOP, page 1) that the Plan and PEIR are intended to provide a framework and guidance for the necessary infrastructure and facilities and streamline the development and permitting of additional renewable energy facilities, mineral recovery, lithium battery manufacturing, and other renewable industries within an approximately 51,786 acre area within and adjacent to the Salton Sea. This area is also a sensitive and rich tribal cultural resource cultural landscape identified as the Southeast Lake Cahuilla Active Volcanic Cultural District (Cultural District). Yet the sensitive setting for the proposed Project is largely overlooked in the

NOP, IS, and related County documents; for example, the IS provides a mere one sentence setting description, wholly failing to include reference to the sensitive tribal cultural landscape or significant biological values and habitat. (IS, page 8).

A confidential draft of the Cultural District, encompassing several volcanic features and their setting, is attached as **Exhibit 2 (Confidential)**.[1] The Salton Buttes are defined by geologists as a collection of five late Quaternary rhyolitic volcanic necks in the Salton Sea Geothermal Field whose high geothermal gradient results from the shallow magma body of the spreading center between the San Andreas and Imperial faults. The IS says the Plan area is characterized by these "notable topographic features" (IS, page 5). Each of the identified tribal cultural resource features (Obsidian Butte, Rock Hill, Red Hill/Island, Mullet Island, the old and new mud pots)(collectively, Cultural Features) and their setting(s) must be protected from direct, indirect, and cumulative impacts. While there have been some impacts to features within the Cultural District, it is a dynamic and resilient landscape, and retains integrity in the eyes of tribal communities.

That the Proposed Project's Land Use Plan (Land Use Plan) does not adequately describe either these resources or the Project's effects on them may not be surprising given the County's exclusion of tribes with cultural concerns from the stakeholders consulted throughout the County's process. Such tribes were left out of the County's Existing Conditions Analysis and Baseline Report efforts which considered development constraints that were "foundational" to the Plan and PEIR scoping (County's Land Use Alterative Memorandum dated October 27, 2023 (Memorandum), page 6). These spiraling documents did not include tribal concerns from the very start and failed to course correct despite repeated requests at public meetings, in hearings, and in letters. Given this significant deficit, the IS's assertion of "transparency," "inclusivity", and "good faith effort" to contact affected agencies, organizations, and persons who may have an interest in this Project rings hollow (IS, page 3).

Deficiencies in Tribal Consultation

The IS asserts that the County has sent SB 18 and AB 52 letters to tribes and that "no Tribes have requested consultation." (IS, pages 45-46). This is incorrect. Ms. Lucas sent letters to the County specifically requesting to be consulted under SB 18 and AB 52 (See, for example, **Exhibit 3**) and also requested to be consulted by the County at public meetings with the County management and staff present such as the Lithium Valley Commission and Controlled Thermal Resources (CTR) project. Yet, no effort has been made by the County to engage her in the PEIR process as of the date of this letter contrary to the short representations in the IS (IS pages 9, 45-46).

[1] Given that the County has to date refused to consult with Ms. Lucas, she has no choice but to attach to this letter the working draft map of the identified tribal cultural resource cultural landscape. Pursuant to state and federal law, cultural resource locations are exempt from public disclosure. Typically, this type of information would be provided within confidential consultation.

The lack of tribal response is more indicative of a consultation program that has failed to launch, rather than a lack of interest in the protection of the Cultural District. It also indicates a complete lack of effective engagement by the County towards tribes with cultural concerns, contrary to the requirements of SB 125. Moreover, the IS provided reference to none of the typical evidence of outreach to tribes, such as certified return receipts, a consultation contact log, or other indicia. Also, it is a well-known best practice to follow up any mass mailing effort with directed phone calls or other specific outreach to potentially affiliated tribes. No evidence has been provided of any such follow up efforts to engage tribes with cultural concerns. We remind the County that the California Attorney General has recently filed an amicus brief supporting Koi Nation in its suit against a City in northern California arguing that: 1) Meaningful consultation under CEQA requires more than a cursory approach; and 2) Agencies must consider tribal expertise in determining tribal cultural resources, significant impacts to those resources, and mitigation measures under CEQA. (See **Exhibit 4).**

To help perform the required consultation, we suggest the County hire or contract a qualified and experienced Tribal Liaison staff member who can connect with Tribes in a more successful manner. We also suggest the County follow the updated CEQA Appendix G: Environmental Checklist Form that references a lead agency developing a Consultation Plan, in consultation with affiliated tribes, to help ensure that the required consultation pursuant to CEQA takes place and is performed in an appropriate, timely, respectful, and orderly manner. Such consultation should include how best to reference the results of tribal consultation in the PEIR without violating requirements for confidentiality. We also note that the County also had established several Technical Advisory Groups, a Working Group, and a Task Force (Memorandum, page 10). None of these related to cultural sites or tribal concerns. Formation of a Tribal Advisory Group, while late in the process, could also assist the County in realizing required tribal engagement.

Incomplete Project Description

The NOP states that the Plan aims to facilitate existing and future renewable energy development, lithium extraction, associated infrastructure, commercial, and related manufacturing industries investment that provides quality local jobs, while minimizing adverse effects on the environments and public health (NOP, page 1). Based on the lack of tribal consultation, as reflected in the documents provided to the public thus far, we do not agree that the proposed Project minimizes adverse effects on the environment or public health. In fact, the Land Use Plan (NOP, Figure 2) demonstrates a *complete lack of balance*, setting little to no land truly off limits to industry, and in fact, facilitates the hoarding and extraction of the area's resources for the benefit of industry, while providing essentially illusory conservation values, as detailed below.

Second, the IS references a "first phase" or "focus area" of approximately 10,000 acres. (IS, pages 2, 5, 47). However, neither the NOP nor the IS describe how the first phase or focus area relates to the Land Use Plan area or where that phase is located. For example, the IS text says that IS, Figure 1, describes those areas proposed for earliest development and conservation (IS,

page 5); however, Figure 1 does not specifically reference the areas for the earliest Project development, but rather the Project Location, contrary to the text. This vague phasing reference also raises concerns regarding Project segmentation which is disallowed under CEQA. Finally, it is unclear why the first phases of the proposed Project may be located in and around the most environmentally and culturally sensitive features.

Proposed Project Land Use Plan – Initial Tribal Concerns

The IS states that the Land Use Alternatives were developed with public and "stakeholder input." (NOP, page 1). However, nowhere are the specific stakeholders listed or defined. This raises a concern about special access for industry and potential conflicts of interest. In contrast, Ms. Lucas was given no opportunity to provide input or review into the Land Use Plan or its predecessor Land Use Alternatives. Evidently, there, the County invited certain parties to develop and assess several (four) Land Use Alternatives and come up with refined evaluation criteria and objectives. In fact, cultural resources, tribal cultural resources, and tribes are wholly absent from the Evaluation Criteria. This lack of inclusiveness demonstrates the absence of equity surrounding the Project. Further underscoring the importance of inclusion in the process, the IS indicates that the current General Plan Designations and Zoning would be changed from "Recreation/Open Space," "Government/Special Public," and "Agriculture" to ones accommodating large scale industrial development, as described below. (IS, page 7). If Ms. Lucas had been timely consulted, she would have been able to raise the following concerns before the Land Use Plan was developed and industry expectations set:

- The Preferred Alternative Land Use Plan attached to the Memorandum (October 2023), appeared to show more Conservation designated lands than the Land Use Plan attached to the NOP (November 2023). This appears to be a result of additional special access afforded to certain industry stakeholders versus a reaction to public comment. The Memorandum had boasted that the Preferred Alternative Land Use Plan "Increases the Conservation Area to cover culturally significant areas and future Salton Sea Management program sites." (Memorandum, page 37). This graphic was then changed behind closed doors. Please disclose the changes including total Conservation acres represented in both graphics and explain the basis for reducing or changing those important Conservation designations. What factors were weighed? What Cultural Features within the Cultural District are shown as conserved (or not) in each? The currently proposed Conservation designation also includes activities that are *atypical* for conserved lands including but not limited to allowing subsurface geothermal wells, subsurface mineral rights, and additional uses that could be allowed by the Director of Planning. On what basis would the Director of Planning assess proposals for compatibility with conservation values? What assurances are there for tribes that they would be consulted by the County regarding potential additional allowed uses? What environmental review would occur? What guardrails would there be that "conserved" lands would not be adversely affected by these additional uses, including by new technologies or slant drilling?

- It appears the Green Industrial designation is shown around at least three cultural features (Obsidian Butte, Rock Hill, and the old mud pots), with no buffers. As shown, this would allow - immediately adjacent to Cultural Features - geothermal plants, storage, distribution, and administrative facilities, including uses conducted outside a building, along with geothermal energy production and mineral recovery, biofuel generation, and green hydrogen, as well as supportive manufacturing, commercial, logistics, and battery manufacturing and storage. Why are there no buffers between Conservation and so-called Green Industrial areas? Now is the best time to ensure the Cultural Features will be considered in planning and avoid potential construction and operational effects on them.

- Why was the Playas Renewables designator expanded as to use and size? It appears this designator is shown on or near all the Cultural Features, except possibly the old mud pots (which appear themselves to be affected by a Green Industrial designator), again with no buffers.[2] As shown, this Land Use would allow geothermal energy operations and mineral recovery, subsurface geothermal wells, pipes and mineral rights, solar photovoltaic structures, and floating structures (floatovoltaics), on or immediately adjacent to Cultural Features. Why are there no buffers between Conservation and Playas Renewables areas? Right now is the best time to ensure the Cultural Features will be considered in planning and avoid potential construction and operational effects on them.

- The Playas Restoration designator is also of concern as it appears to be near and within the current viewscape setting for several Cultural Features, except possibly, the mud pots. This Land Use designator would allow above-surface environmental restoration activities, subsurface mineral rights, air quality monitoring structures, and photovoltaics, and exceptions may be allowed with Director of Planning approval. Again, on what basis would the Director of Planning assess proposals for compatibility with conservation values? What assurances are there for tribes that they would be consulted by the County regarding potential additional allowed uses? What environmental review would occur? What guardrails would there be that "restored" lands would not be adversely affected by these additional uses, including by new technologies or slant drilling? What assurances are there for tribes that the current expansive cultural viewsheds over the Sea will be protected and not be adversely affected? Now is the best time to ensure the Cultural Features will be considered in planning and avoid potential construction and operational effects on them.

- What is the basis of the 950-foot and 785-foot buffers for the Floodway description along the Alamo and New Rivers, respectively? Has a wetland delineation been done? Are the modest buffers sufficient particularly given that the banks may be "unstable"

[2] It is notable that the IS, page 75 (General Descriptions), touts that the Community Opportunity Areas "act as large-scale buffers" between residents and industrial-type land uses. Yet, no buffers are provided for Cultural Features and these same industrial-type land uses.

and the Project sits within a Special Flood Hazard Area (IS, pages 28, 36). How do these floodway buffers compare with the distance of proposed industrial uses from identified Cultural Features and the Cultural District? Are all the proposed allowed uses, especially "passive recreation such as picnic tables and trails" compatible with the sensitive biological and Cultural Features in and near Floodway areas? Please add a description of the "Conceptual Rec Easement" to the Figure 2 General Descriptions of Proposed Land Use Designations (NOP, page 4) and explain how this may relate to the Floodway description.

- A Main Transportation Corridor and Rail Spur are shown immediately adjacent to the Obsidian Butte area and the Sonny Bono Wildlife Refuge. Placing such uses adjacent to these significant conservation areas and Cultural Features would introduce truck, rail, and other incompatible industrial uses, noises, and odors to these sensitive areas. Appropriate buffers, using reasonable metrics including examples of successful buffers successfully used at other sensitive sacred places, should be studied and developed in consultation with tribes with cultural concerns.

- The Evaluation Criteria and Methodology for the Preferred Land Use Alterative included no reference to cultural resources, tribal cultural resources, or tribal communities. (Memorandum, pages 40-41). Therefore, it would seem appropriate to conclude that the asserted "objective, research-based" comparison of alternatives has a significant gap.

- Given the significant issues above, what is the basis and evidence supporting that the Land Use Plan meets the Memorandum's Guiding Principal 6: Acknowledge and Respect Indigenous Lands? (Memorandum, page 5).

Scoping for Evaluation of Environmental Impacts

The IS evaluation of environmental impacts did not consider impacts of tribal concern across the required topic areas. Ms. Lucas requests the PEIR study and analyze the following:

- 3.1 Aesthetics: The direct, indirect, and cumulative effects on light, glare, and daytime setting, and lights, sky glow, dark night skies, and nighttime setting on the Cultural Features and Cultural District must be studied and in consultation with affiliated tribes with cultural concerns. The views *to* and *from* each of the Cultural Features must also be studied and protected from impacts; views include the sight lines *between* the individual Cultural Features and *from* the Cultural Features to the elements of sacred geography around the valley including the Santa Rosa Mountains, Laguna Mountains, Signal (Eagle) Mountain, Fish Creek Mountains, Pilot Knob, Chocolate Mountains, and the Salton Sea. The long views and viewsheds from the Cultural Features *over* the Salton Sea, California's largest lake, also must be considered and protected, as should any long views *towards* the Cultural Features, such as on approach from the south and northeast, as they relate to the ceremonial and teaching values of the historic property. (See also, Cultural Resources and Tribal Cultural Resources sections below).

- 3.3 Air Quality: The direct, indirect, and cumulative effects of particulates, haze, change of atmospherics, and odors on the Cultural Features and Cultural District must be studied in consultation with affiliated tribes with cultural concerns. It is worth noting that the area is already classified by the State as nonattainment for ozone and particulate matter less than 10 microns (IS, page 18). In addition to the communities of Niland, Calipatria, and Brawley, and scattered residences, tribal communities who use the Cultural District should be considered sensitive receptors. For example, construction at the new CTR facility was emitting odors earlier this month that were discernible off site and along public roadways interfering with tribal users visiting Cultural Features in the area.

- 3.4 Biology: Please be clearer about whether any federal permits would be required for the Project including those from the United States Army Corps of Engineers or the United States Fish and Wildlife Service, or whether wetland delineations and Biological Opinions will be required. (IS, pages 20-21). Those federal agencies have an independent obligation to consult with affiliated tribes, including under the National Historic Preservation Act (NHPA) and the National Environmental Policy Act (NEPA). The wetlands, biological species (vertebrates and cultural plants), and wildlife corridors are also part of the Cultural District: species are reflected in the Bird Songs and Legends of local tribal peoples and must be considered for protection. On or offsite mitigation for wetlands or dust suppression, such as the Species Conservation Habitat (SCH) Project, both inside and outside of the Plan area, in turn, could have adverse effects on the Cultural District and must be analyzed pursuant to CEQA. (IS, page 22). Ms. Lucas also generally concurs with the request of conservation and wildlife stakeholders for connected conservation areas to be protected near the Salton Sea, promoting habitat connectivity for sensitive species. (Memorandum, page 34). The Cultural District boundaries serve dual purposes and could provide and accommodate biological connectivity. All such tribal cultural resources should be consulted on and efforts made to protect them and their setting as part of the Plan. (Please see concerns about the adequacy and enforceability of Conservation designated areas above).

- 3.5 Cultural Resources: This short section references conducting archival review only and lacks any discussion of *how* cultural resources will be addressed in the PEIR (IS, page 23). This should be a topic of consultation with affiliated tribes with cultural concerns. Will surveys of properties within the Plan area be conducted, if so, using what protocols and will qualified tribal monitors be present for the identification of cultural resources of concern to tribes? It is critical for more than archaeological surveys to be performed; tribal cultural resources are a separate category of resources under CEQA and require special expertise. The IS also states that the Project would need to ensure it does not conflict with the provisions of the Desert Renewable Energy Conservation Plan (DRECP)(IS, page 23). The County should consider establishing a similar or companion program to mitigate cumulative effects of the Project in consultation with affiliated tribes.

- 3.7 Geology and Soils: Ms. Lucas is concerned about the Project (including weight of Project elements) contributing to or triggering seismic action in the area, particularly regarding the Brawley Seismic Zone and volcanic activity within the Salton Buttes, a tribal sacred place. We disagree with the conclusion of the IS that the impact on landslides is less than significant simply because "Obsidian Butte is a recognized sensitive resource to be protected" (IS, page 27). Rock Hill and Red Hill/Island are also recognized sensitive resources. The IS is unclear whether these sensitive resources will also be protected, or developed, and, even if protected, might they still be vulnerable to landslides or other effects caused by the Project. Moreover, the IS seems to state that Rock Hill and Red Hill are different names for the same resource (IS, page 28). This is incorrect; they are different volcanic domes within the Salton Buttes having separate cultural features and functions within the Cultural District also meriting study relative to landslides. The PEIR should also study how the Project could adversely affect the functioning of the mud pots, such as causing them to stop bubbling, move, or dry up.

- 3.9 Hazards and Hazardous Materials: The IS admits that the Project could result in significant hazards through upset and accidents involving the release of hazardous materials into the environment. (IS, Page 31). Such releases are a particular concern for Ms. Lucas within and adjacent to the Cultural District given the sensitive tribal cultural values and uses of these areas. Again, excluding Project elements that pose such risks from the Cultural District and applying appropriate buffers between those areas and industrial effects are requested to minimize adverse effects on historic properties.

- 3.10 Hydrology and Water Quality: Ms. Lucas is concerned about potential discharges to the Salton Sea, one of the Cultural Features in the Cultural District. Would the Project cause change to the sea's chemistry that could harm species or result in sediment clean-up efforts that could, in turn, damage tribal cultural resources, including those that are currently under the sea? We are also concerned about a potential decrease in groundwater supplies and reduction in recharge, which could also adversely affect the functioning of the mud pots, such as causing them to stop bubbling, move, or dry up. What is the proposed definition of "sustainable groundwater management" for the Project area? Also, even if a basin may be considered of "poor quality" and "unsuitable" for most domestic and irrigation uses, it may still provide critically important biological resource habitat and cultural landscape values, especially given the area's arid desert conditions. We are also concerned about changes to existing drainage patterns, flooding, and run off which in turn could adversely affect the Cultural District. Given these Project specific factors, a Groundwater Sustainability Plan and/or a Comprehensive Water Management Strategy must be performed and these issues studied in the PEIR.

- 3.11 Land Use and Planning: The IS admits that the Project has the potential to cause significant environmental impact due to conflicts with various land use plans, policies, and regulations adopted to avoid or mitigate environmental effects. (IS, page 37). Ms. Lucas is interested in understanding how the provisions of the SCH Project, the DRECP,

IID's policies, and any other adopted Habitat Conservation Plans (HCPs) intersect with the Project and that the County be required to mitigate impacts to the maximum extent possible and not simply paper over such conflicts while rushing towards a Statement of Overriding Considerations.

- 3.12 Mineral Resources: The PEIR should clearly describe the number, parties, nature, and duration of mineral leases in the Project area, particularly those within or adjacent to the Cultural District. We understand the Native American Land Conservancy has tried to view copies of leases from IID without success.

- 3.13 Noise: The potential effects of Project construction and operation on the Cultural District and Cultural Features within it must be studied. The Noise Report should consider tribal cultural users as sensitive receptors and include noise and vibrational effects on the Cultural Features within the Cultural District. For example, sounds emanating from the existing geothermal plant near the Sonny Bono Reserve can be heard at Rock Hill and are impactful to the cultural (and recreational) experience, this includes geothermal facility alarms being heard at Rock Hill and activating the coyote packs that live in the brush below. Further, the sounds from the existing geothermal facility near Obsidian Butte can be readily experienced from the obsidian outcroppings on the west side of the butte. How would build out of the Plan increase such effects? What measures can be taken to reduce off-site noise effects including best available technologies or waivers of certain requirements?

- 3.14 Population and Housing: The IS admits that the Project has the potential to induce significant unplanned population growth in the area (IS, page 40). Ms. Lucas is concerned about the inducement of workers and residents to the sensitive and exposed Cultural Features in the Project area, including with respect to increased numbers of people, their proximity to features, and paving of local roads. Potential adverse effects, in turn, include erosion caused by increased off road foot or car traffic, induced erosion or runoff, trash, damage to features (as observed at other locations of interest), and loss of privacy for tribal cultural activities. These induced effects would be exacerbated by the overall lack of designed parks and recreational facilities elsewhere in the Plan, thereby putting a further strain on the Cultural District to provide such activities which may result in deterioration of its cultural values. (IS, page 43). Further, efforts to manage public activity, such as fencing, boardwalks, etc., may in themselves cause adverse effects to historic properties. This warrants study and solutions, which may include sufficient short and long term funding, and needs to be developed in consultation with affiliated tribes with cultural concerns. A Focused Parks and Recreation Plan that provides appropriate and sufficient designated facilities apart from the Cultural District also should be studied in the PEIR.

- 3.18 Tribal Cultural Resources: Tribes have identified the Cultural District as eligible for listing in the California Register of Historical Resources (CRHR) and the National Register of Historic Places (NRHP). The PEIR must address this tribally identified tribal cultural

resource tribal cultural landscape in the PEIR. We remind the County that tribes have special expertise in identifying historic properties of religious significance and that preservation professionals are no substitute for tribal expertise. (**Exhibit 5**, draft Advisory Council on Historic Preservation Policy Statement on Indigenous Knowledge and Historic Preservation (January 11, 2024)). Any surveys to be performed must include both archaeological and qualified tribal participants and survey scopes informed by tribal consultation; culturally affiliated tribes must be provided draft reports for input and review prior to finalization. Consistent with state law, avoidance of the resource should be prioritized; any mitigation or treatment must be developed in consultation with affiliated tribes. The IS notes that, "all tribes that were contacted have expressed a clear and unified stance, requesting that Obsidian Butte remains untouched." (IS, page 46). While my client agrees with that statement, she must underscore the following: First, while the IS states that the Plan "will avoid development from [sic] [the Obsidian Butte] area" (IS, page 46), that area also should be protected *now* from activities that may impact its integrity and effect the environmental baseline. Please indicate whether IID or any of its leasees or agents (including the County) are currently removing or otherwise disturbing this sensitive area. It is Ms. Lucas's view that any disturbance to that area should have never occurred and should have ceased long ago. Second, while Obsidian Butte is certainly worthy of protection, there are other Cultural Features within the Cultural District that are also worthy of protection, as is the Cultural District as a whole. Given the evidence, it is hard to understand why there is no Cultural Resource or Tribal Cultural Resources section in the IS's 18-page References section – for example, there remains no mention of Dr. Thomas Gates' report, *Black Rock 1, 2, 3 Geothermal Power Plant Project: Ethnographic Assessment of the Importance of Obsidian Butte to the Native American Community, Imperial County, California* (January 2020), despite it being by name at several Lithium Valley related hearings over the last two years. Why is the evidence of the Cultural District being ignored by the County?

- 3.19 Utilities The IS states there is a high probability that the Project may require the relocation or construction of new or expanded water, wastewater treatment, or stormwater drainage facilities, as well as electric power, natural gas, or telecommunications facilities which could cause potentially significant environmental effects (IS, page 47). In my client's experience, utility and energy projects can cause some of the most deleterious effects on tribal cultural resources. Their effects therefore must be comprehensively studied and mitigated. Ms. Lucas is also gravely concerned about the source of the water to satisfy the approximately 100,000 acre feet demand for the Project (IS, page 47). First, this demand represents only the *first phase* of the Project (which as noted above, has been poorly defined in the Project Description). Yet, the IS states that IID only has *less than one quarter of that amount available* for all new projects. The Project therefore has a significant math problem: a Project should not be approved that out of the gate has significantly insufficient water supplies. Second, Ms. Lucas believes that fresh potable water should be prioritized for residential and environmental needs and that industrial water needs should find other solutions to satisfy their demand – apart from fresh and groundwater supplies. The PEIR should

consider a Project that fits within available water limits. Such alternatives should be studied in the PEIR.

- Cumulative Effects: The PEIR should also examine programmatic mitigation options and structures for tribal cultural resources and otherwise ensure Project benefits to tribes, the first communities in the Valley, through consultation, mitigation, and agreements. (See discussion above regarding Cultural Resources and Tribal Cultural Resources).

- Alternatives: All Alternatives should more clearly protect Cultural Features, the Cultural District, and its setting, including the Environmentally Preferred Alternative. Further, all Alternatives should examine their respective sustainability and resilience strategies – including anticipating the possible refilling of the Sea and the related risks and vulnerability of proposed development in each Alterative.

Other Issues

The IS states that individual projects that build out the Plan may require additional permits (IS, pages 5-6). The PEIR must provide further detail regarding potential permit triggers as well as address the framework for determining when additional environmental review and tribal consultation would be required. This is particularly important, where, as here, the NOP stated that streamlining Project permitting is a goal of the Project (NOP, page 1).

The list of potential Responsible Agencies should likely include the California Energy Commission (CEC)(IS, page 6).

Conclusion

In conclusion, Ms. Lucas requests that her issues, concerns, evidence, and requests in response to the NOP and the IS be used to further scope issues and alternatives in the PEIR. She looks forward to the County reaching out to her through my office to initiate consultation pursuant to SB 18 and AB 52. Please keep us informed of any further action on the PEIR, including public meetings and hearings.

Very truly yours,

Courtney Ann Coyle
Attorney at Law

Attachs. 5

Copies (Select Reviewing Agencies):
CEC
CNRA
CPUC
NAHC
OHP

EXHIBIT 1

Carmen Lucas
Kwaaymii Laguna Band

Carmen Lucas is a Kwaaymii Laguna Indian from Laguna Mountain, San Diego County, and has been a student of her Indian heritage throughout her life. She learned about cultural landscapes and Ancestral human remains from her father, the late Tom Lucas, and has learned about essence of place and intangible cultural resources from being caretaker of her homeland and burial grounds at the former Laguna Indian Reservation, now Lucas Ranch, for the last fifty years.

After a 20 year career in the United States Marine Corps, retiring as a Chief Warrant Officer, Carmen has worked in the field of Cultural Resources Management (CRM) as a Native American Monitor, Consultant, and Educator for nearly forty years, bringing a tribal perspective to cultural resource surveys, planning, and mitigation. She has helped archaeologists and tribal monitors in identifying archaeological deposits and Ancestor remains and burial items to promote avoidance. Carmen is a strong proponent of preservation in place and advocates for increased use of tribal expertise and noninvasive technology in identifying resources, including the use of historic human remains detection canines.

Along with historians and her attorney, Carmen has helped to write and successfully nominate at least five historic properties to the National Register of Historic Places based on their tribal cultural values: *Ah-ha Kwe-ah-mac'* (Cuyamaca Village), *Wiipuk uun' yaw* (Cottonwood Trail), The Kwaaymii Homeland (Lucas Ranch), *Ah-Ha' Mut-ta-tie'* (Laguna "Water" Mountain), and University House at the University of California, San Diego, the rehabilitation of which won the 2015 Governor's Historic Preservation Award. She is passionate about her Ancestors and the power of documentation so that tribal history is not erased and the Ancestors are not forgotten.

Carmen has provided Cultural Resources Sensitivity Training on utility and other projects for all workers who will be in the field to help them identify and respect resources of concern, and is a frequent presenter at local Indian reservations to train new classes of tribal monitors. She served two terms on the Board of the San Diego Archaeological Center (museum and curation facility) and served as an appointee for ten years on the San Diego County Historic Sites Board (designating local historic properties).

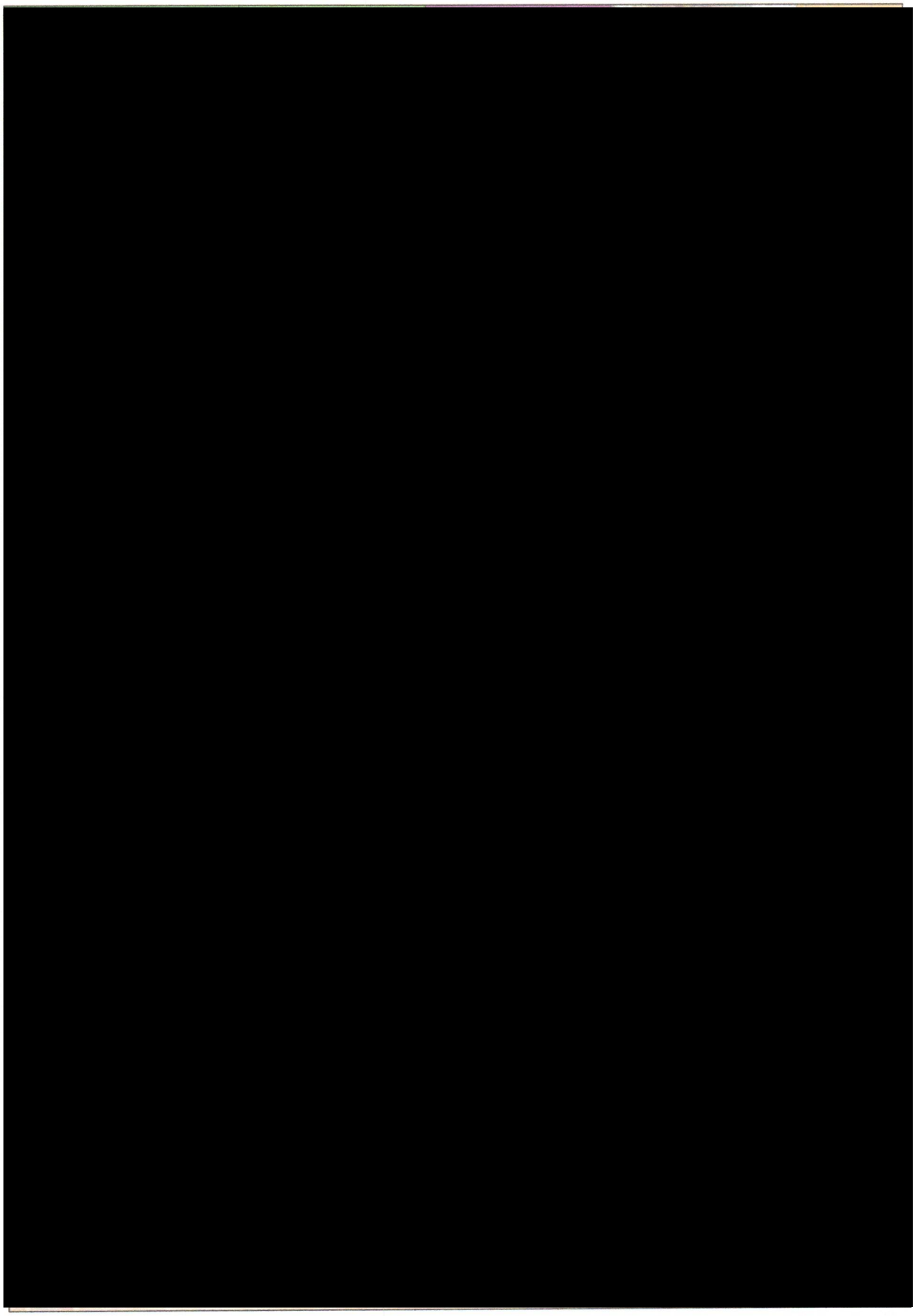
Carmen has been recognized by the Society for California Archaeology with the California Indian Heritage Preservation Award (2004), the City of San Diego Historical Resources Board with the Annual Historic Preservation Award for Cultural Diversity (2014), and the California Office of Historic Preservation with the Governor's Historic Preservation Award (2017). She currently serves as an appointed member on the California Truth & Healing Council, created by Governor Gavin Newsom to bear witness to, record, examine the documentation of, and receive California Indian narratives to clarify the record of the relationship between the state and

tribes, as one of three voting representatives from the Southern California region (San Diego and Imperial Counties).

The *Ah-Ha' Mut-ta-tie'* Eligibility Evaluation Report (2022) was an innovative approach to documentation and evaluation of a Traditional Cultural Property (TCP) consisting of an ethnographic landscape that encompasses approximately 30,670 acres of predominantly undeveloped U.S. Forest Service land in the Laguna Mountains of San Diego County, California. The Report advances historic preservation and resource conservation by finally achieving a formal determination of eligibility for an area that had been studied by archaeologists for 40 years and does so by lifting tribal voices. It also brought together diverse lines of evidence – tribal, archaeological, botanical, animal, hydrological, geological, and spatial – to demonstrate the value of this property. *Ah-Ha' Mut-ta-tie'* also yields significant cultural knowledge that can be passed on to and accessed by future generations of the Kumeyaay. The Report also provides specific public benefits by emphasizing a level of acknowledgement, protection, and cohesive management for a location beloved by so many San Diegans -- Laguna Mountain. It is a tool that will be used to keep the top of Laguna Mountain, the location of scenic Sunrise Highway and public recreation, in its beautiful form and as a place where San Diegans can go to get in touch with nature, clean air, and spiritual well-being. Finally, by centering the tribal voice and applying a multi-disciplinary approach, the report serves as a successful model of the benefits and possibilities for other cultural landscapes in the San Diego region – of which there are many.

EXHIBIT 2

(CONFIDENTIAL)



Confidential Working Draft
4/6/2023

Source: ESRI & USGS.

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EXHIBIT 3

29 SEPT 2022

DIRECTOR -
PLANNING AND DEVELOPMENT SER.
801 MAIN STREET
EL CENTRO, CALIF. 92243

To Whom it may concern

I AM CARMEN LUCAS A KWAAYMII LAGUNA MOUNTAIN INDIAN WHO IS LISTED WITH THE NATIVE AMERICAN HERITAGE COMMISSION CONTACT LIST.

I AM REQUESTING THAT MY NAME AND ADDRESS BE ADDED ON THE IMPERIAL COUNTY SB-18 AND SB52 CONSULTATION LIST IF I'M NOT ALREADY ON IT. THIS REQUEST INCLUDES THE SPECFIC PLAN & PEER FOR LITHIUM RECOVERY. I AM ALSO SPECIFICALLY REQUESTING CONSULATION ON THAT PROJECT.

THANK YOU

CARMEN LUCAS
PO BOX 775
PINE VALLEY CA.
91962

1-619-709-4207

EXHIBIT 4

ROB BONTA
Attorney General

Attorney General Bonta Files Amicus Brief Supporting Koi Nation in Lawsuit Against City of Clearlake

Press Release / *Attorney General Bonta Files Amicus Brief Supporting Koi Nat...*

Friday, October 20, 2023

Contact: (916) 210-6000, agpressoffice@doj.ca.gov

OAKLAND — California Attorney General Rob Bonta today announced that the Lake County Superior Court has granted the Department of Justice's application to file an amicus brief in support of the Koi Nation of Northern California's lawsuit against the City of Clearlake. The Koi Nation contends that the site of a proposed 75-room hotel — known as the Airport Hotel and 18th Avenue Extension — contains tribal cultural resources and that the city did not adequately conduct consultation with the Koi Nation or consider the project's impacts on tribal cultural resources, in violation of the California Environmental Quality Act's (CEQA) tribal consultation requirements added by Assembly Bill 52 (AB 52). The Department of Justice's amicus brief supports the Koi Nation's position, providing information on the legislative history and intent of AB 52's requirements.

"The Clearlake area is home to Native American tribes who have lived there since time immemorial," **said Attorney General Rob Bonta**. "The preservation of tribal cultural resources is of great importance. We stand with the Koi Nation in seeking justice and accountability. The California Legislature passed AB 52 to ensure that government agencies' consultation with tribes regarding their tribal cultural resources would be meaningful — that simply didn't happen here."

"As a Southeastern Pomo Tribe with an area of traditional and cultural affiliation that stems from the Pomo homeland of Southeastern Clear Lake to the Russian River Valley in Sonoma County, the Koi Nation of Northern California is grateful for the action and leadership of Attorney General Rob Bonta and his hardworking team," **said Vice Chairman of the Koi Nation Dino Beltran.** "We hope this will be helpful for all California Native American Tribes in their protection of Tribal Cultural Resources moving forward. It is important to recognize traditional cultural knowledge as evidence. Our case is strengthened by the expertise and knowledge of Tribal Cultural Resources shared by Tribal Historic Preservation Officer and cultural practitioner Robert Geary."

In the amicus brief, Attorney General Bonta argues that:

- **Meaningful consultation under CEQA requires more than the city's cursory approach.** As amended by AB 52, CEQA requires consultation to be a "meaningful and timely process." In this case, the city held a single meeting with the Koi Nation and did not respond to the Koi Nation's subsequent communications flagging concerns about tribal cultural resources and suggesting mitigation measures. The city then unilaterally ended consultation without informing the Koi Nation of its conclusion or explaining in the record why mutual agreement was not possible.
- **Agencies must consider tribal expertise in determining tribal cultural resources, significant impacts to those resources, and mitigation measures under CEQA.** When the Legislature amended CEQA under AB 52, it distinguished tribal cultural resources from archaeological resources or historical resources under CEQA and required lead agencies to evaluate impacts to tribal cultural resources as a separate resource category. The Legislature also required lead agencies to incorporate tribal expertise and input when determining the existence of those resources, the potential for impacts on them, and the sufficiency of mitigation measures for avoiding those impacts. In this case, the city relied solely on a study by the city's archaeologist — and ignored tribal input and expertise — in identifying tribal cultural resources on the project site.

A copy of the amicus brief can be found **here.**

# # #

EXHIBIT 5

ADVISORY COUNCIL ON HISTORIC PRESERVATION
POLICY STATEMENT ON INDIGENOUS KNOWLEDGE AND HISTORIC PRESERVATION

PREAMBLE. Indian Tribes, Native Hawaiians, and other Indigenous Peoples are the original stewards of what is now known as the United States and its various territories and jurisdictions. They have existed as part of their environments for countless generations and have accumulated extensive experiences with, information about, and knowledge of the natural and cultural environment. This knowledge, often referred to as "Indigenous Knowledge," results from a reciprocal relationship with their traditional territories whereby Indian Tribes, Native Hawaiians, and other Indigenous Peoples both shape and are shaped by the places and landscapes that surround them.

As a result of this interdependent relationship between people and place, sacred sites, and historic properties, including properties of religious and cultural importance to Indian Tribes, Native Hawaiians, and other Indigenous Peoples, exist throughout the United States and its territories and jurisdictions. These locations are often considered to be of great importance by the Indigenous People who ascribe meaning to them and are frequently associated with significant cultural events, important spiritual locations, or are an active part of their living culture.

Indian Tribes, Native Hawaiians, and other Indigenous Peoples frequently rely upon their Indigenous Knowledge to identify and interact with these locations. Sacred sites, historic properties, and properties of religious and cultural importance are often imbued with both tangible and intangible values and resources that are not readily known outside of the community, clan, family, or individual who ascribe significance to them. Therefore, it is critical that federal agencies, state and local governments, and nongovernmental institutions, including private contractors, respect the value of and actively seek to incorporate Indigenous Knowledge into their historic preservation programs and decision making.

SCOPE OF THE POLICY. The field of historic preservation should ensure that the archaeological sites, historic structures, cultural landscapes, sacred sites, and other sites of religious and cultural importance to Indian Tribes and Native Hawaiians are equitably considered in decision making. These locations, and the reasons they are important to Indian Tribes, Native Hawaiians, and other Indigenous Peoples, are often best understood and accounted for through consultation with, and by applying the Indigenous Knowledge of, associated Indian Tribes, Native Hawaiian organizations, and other Indigenous Peoples.

Unfortunately, the historic preservation community has struggled to consistently acquire and incorporate Indigenous Knowledge into decision making in an efficient or effective manner. This partially stems from the fact that Indigenous Knowledge has not to date been thoroughly accounted for in implementing the statutory and regulatory framework that guides historic preservation, including the National Historic Preservation Act (NHPA) and its related regulations; nor is Indigenous Knowledge mentioned in the Secretary of the Interior's Professional Qualifications standards or Executive Order 13007: Indian Sacred Sites. Additionally, many federal agencies, state and local governments, and nongovernmental institutions, including private contractors, lack protocols that account for the role of Indigenous Knowledge in meeting their program objectives and compliance responsibilities.

Despite these challenges, the Advisory Council on Historic Preservation (ACHP) has identified the integration of Indigenous Knowledge into decision making as both valuable and, in some circumstances, a

mandatory part of the Section 106 process the ACHP administers as part of its responsibilities pursuant to the NHPA.[1] In 2019 the ACHP clarified that while the term Indigenous Knowledge is not defined in the NHPA or its implementing regulations, its role in the Section 106 process is necessitated by the regulation stating that agency officials "shall acknowledge that Indian tribes and Native Hawaiian organizations (NHOs) possess special expertise in assessing the eligibility of historic properties that may possess religious and cultural significance to them."

In 2022 the White House released its *Guidance for Federal Departments and Agencies on Indigenous Knowledge*, an interagency resource meant to promote and enable a broad effort to improve the recognition and inclusion of Indigenous Knowledge. It reaffirms that Indigenous Knowledge should be recognized and, as appropriate, incorporated into decision making, research, and policies. It also advised that agencies use this guidance to develop an approach to Indigenous Knowledge that is appropriate for the contexts and legal frameworks in which they operate and for the Indian Tribes, Native Hawaiian organizations, and other Indigenous Peoples with whom they partner and consult.[2]

The ACHP developed this policy statement to 1) generate consistency within the broader preservation community, 2) respond to the challenges outlined above, 3) identify the role Indigenous Knowledge has in the Section 106 process, and 4) to establish a set of standards and guidelines related to the acquisition and use of Indigenous Knowledge in historic preservation more broadly. This policy clarifies that Indigenous Knowledge should be recognized as an independent, self-supporting line of evidence meant to support program, policy, and procedural decisions related to historic preservation,[3] and identifies designated representatives of Indian Tribes and Native Hawaiian organizations as the appropriate subject matter experts capable of informing decision making related to such knowledge.

The policy also calls on the preservation community to ensure that the appropriate amount of time and resources are dedicated to the identification, documentation, utilization, management, and safeguarding of Indigenous Knowledge, along with developing guidance to inform these activities. An overarching goal of the policy is to ensure that the Indigenous Knowledge of Indian Tribes, Native Hawaiians, and other Indigenous Peoples has an equitable and ongoing role in the decision-making process, recognizing the history of federal-Tribal relations has not consistently or effectively accounted for this information.

AUTHORITY. The ACHP has the statutory responsibility to advise on matters relating to historic preservation, to advise the President, Congress, and state and local governments, regarding historic preservation matters, and to recommend methods to federal agencies to improve the effectiveness, coordination, and consistency of their historic preservation policies.[4]

As a federal agency, the ACHP also has a unique legal and political relationship with federally recognized Indian Tribes as set forth in the Constitution of the United States, treaties, statutes, and court decisions, and acknowledges that the federal Indian trust responsibility is a legal obligation under which the United States "has charged itself with moral obligations of the highest responsibility and trust" toward Indian

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[1] The ACHP is an independent federal agency with the primary mission to encourage historic preservation in the government and across the nation. A key ACHP function is overseeing the federal historic preservation review process established by Section 106 of the NHPA. Section 106 requires federal agencies to consider the effects of projects, carried out by them or subject to their assistance or approval, on historic properties and provide the ACHP an opportunity to comment on these projects prior to a final decision on them.

[2] Guidance for Federal Departments or Agencies on Indigenous Knowledge (Executive Office of the President Office of Science and Technology Policy [OSTP] and Council on Environmental Quality [CEQ], 2022).

[3] The Foundations for Evidence-Based Policymaking Act (Evidence Act - Pub. L. 115-435 (2018)), established a process for the federal government to modernize data management practices, evidence-building functions, and statistical efficiency. The focus of the Evidence Act is on outcomes where agencies use all available evidence to make better program, operational, and other decisions, and build evidence where it is lacking. Indigenous Knowledges can be a form of evidence as described in the Act, and offices and bureaus should consider this whenever evidence is relevant.

[4] 54 U.S.C. §§ 304102 and 304108.

Tribes.[5] In general, the trust responsibility establishes fiduciary obligations on the part of federal agencies to Tribes, including a duty to protect Tribal lands and cultural and natural resources for the benefit of Tribes and individual Tribal members. An element of the ACHP's trust responsibility is to ensure that its promulgation of the regulations implementing Section 106 of the NHPA incorporate the procedural requirement that federal agencies consult with Indian Tribes and NHOs that attach religious and cultural significance to historic properties that may be affected by undertakings the federal agency proposes to carry out, license, permit, or assist.[6] The ACHP's trust responsibility encompasses all aspects of historic resources, including associated Indigenous Knowledge and other intangible values.[7]

Consistent with its statutory responsibilities, and as part of its trust responsibility to Indian Tribes, the ACHP issues this policy statement to establish a set of standards and guidelines regarding the role that Indigenous Knowledge has in historic preservation.

INDIGENOUS KNOWLEDGE. For the purposes of this policy, the ACHP will utilize the definition of Indigenous Knowledge published in the 2022 *Guidance for Federal Departments and Agencies on Indigenous Knowledge*:

> *Indigenous Knowledge is a body of observations, oral and written knowledge, innovations, practices, and beliefs developed by Tribes and Indigenous Peoples through interaction and experience with the environment. It is applied to phenomena across biological, physical, social, cultural, and spiritual systems. Indigenous Knowledge can be developed over millennia, continues to develop, and includes understanding based on evidence acquired through direct and indirect contact with the environment and long-term experiences, as well as extensive observations, lessons, and skills passed from generation to generation. Each Indian Tribe, Native Hawaiian, and Indigenous community has its own place-based body of knowledge.*
>
> *Indigenous Knowledge is based in ethical foundations often grounded in social, spiritual, cultural, and natural systems that are frequently intertwined and inseparable, offering a holistic perspective. Indigenous Knowledge is inherently heterogeneous due to the cultural, geographic, and socioeconomic differences from which it is derived, and is shaped by the Indigenous Peoples' understanding of their history and the surrounding environment. This knowledge is unique to each group of Indigenous Peoples, and each may elect to utilize different terminology or express it in different ways. Indigenous Knowledge is deeply connected to the Indigenous Peoples holding that knowledge.*[8]

This definition is intended to inform and educate the reader and to provide necessary context. It is not intended to limit or constrain the application of Indigenous Knowledge.

POLICY PRINCIPLES These principles should be applied by federal agencies, state and local governments, and nongovernmental institutions, including private contractors, to advance the integration of Indigenous Knowledge into historic preservation decision making. The following principles represent minimum standards the preservation community should seek to advance as part of their site stewardship, Section 106 participation and compliance, sacred sites management, other historic preservation related actions, consistent with their unique mission and authorities.

1. **Respect and Relationship Building.** Indigenous Knowledge should be treated with respect in all circumstances. This knowledge is frequently revered by the individual, family, clan, or community

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[5] *Seminole Nation v. United States*, 316 U.S. 286 (1942).

[6] The Advisory Council on Historic Preservation's Statement on Its Trust Responsibility (Advisory Council on Historic Preservation, 2004).

[7] Policy Statement Regarding the Council's Relationship with Indian Tribes (Advisory Council on Historic Preservation, 2000).

[8] Guidance for Federal Departments or Agencies on Indigenous Knowledge (Executive Office of the President Office of Science and Technology Policy [OSTP] and Council on Environmental Quality [CEQ], 2022), 4.

associated with it and it may have an active role in ongoing cultural practices and ways of understanding. Disrespect, misuse, or abuse could violate cultural and ethical protocols, or may impact an Indian Tribe or Native Hawaiian community in other manners, including socially, politically, legally, or economically. Developing and maintaining a positive and mutually beneficial relationship with Indian Tribes and Native Hawaiian communities can help facilitate increased understanding of what constitutes respect and how those actions can lead to the proper acquisition and integration of Indigenous Knowledge into decision making.

2. **Valid and Self-Supporting**. The Indigenous Knowledge held by an Indian Tribe, NHO, or other Indigenous Peoples is a valid and self-supporting source of information and an aspect of the best available science. It does not require verification by any other knowledge system in order to inform federal decision making. Designated representatives of Indian Tribes and NHOS are, and should be recognized as, subject matter experts regarding the application of Indigenous Knowledge with respect to the identification and documentation, evaluation, assessment of effects, and in the resolution of adverse effects to properties that may be of religious and cultural significance to them, many of which may also be sacred sites.

3. **The Section 106 Process.** For purposes of Section 106, the term "Indigenous Knowledge" includes, but is not limited to, the experiences, insights, and knowledge held by Indian Tribes and NHOs that can assist federal agencies in identifying, evaluating, assessing, and resolving adverse effects to properties that may be of religious and cultural significance to them. Deference can and should be provided to the expertise of designated representatives when Indigenous Knowledge is provided to inform decision making in the Section 106 process. A reasonable and good faith effort includes the responsibility that federal agencies incorporate Indigenous Knowledge in a successive and cumulative manner throughout the four-step Section 106 process.

   a. **Identification and Documentation**. Indigenous Knowledge is frequently used by Indian Tribes and NHOs to identify properties that may be of religious and cultural importance to them in the Section 106 review process. The development and implementation of identification efforts, including background research and field surveys, should be informed by Indigenous Knowledge to ensure these actions more effectively account for properties that may be of religious and cultural significance. Documentation or recordation of the property or place should reflect the qualities and characteristics identified as relevant by the associated Indian Tribe or NHO to inform subsequent decision making, including evaluation, assessment of effect, and resolution of adverse effects effectively and accurately.

   b. **Evaluation**. The "special expertise" applied in 36 CFR § 800.4(c)(1) is a component of Indigenous Knowledge. To "acknowledge" that Indian Tribes and NHOs possess special expertise in evaluating historic properties that may be of religious and cultural significance to them, per the requirement in the NHPA and the Section 106 regulations, federal agencies shall consult with designated representatives of Indian Tribes or NHOs to inform the evaluation of significance and integrity of such properties when making determinations of eligibility. Members of the preservation community are not the experts on what constitutes Indigenous Knowledge or how it is utilized to identify or evaluate the eligibility of a property that may be of religious and cultural significance.

   c. **Assessment of Adverse Effects.** Indian Tribes and NHOs are the authorities and experts about their respective culture, lifeways, and history. To understand if and how an undertaking may affect a historic property of religious and cultural significance to an Indian Tribe or NHO, the federal agency must take into account, and base its assessment of how that property would be affected by the proposed undertaking on, the Indigenous Knowledge and comments provided by the associated Indian Tribes or NHOs.

   d. **Resolution of Adverse Effects.** Agencies should provide deference to the expertise of associated Indian Tribes or NHOs when seeking to resolve adverse effects to a historic property of religious

and cultural significance. Efforts taken to avoid or minimize adverse effects should reflect the Indigenous Knowledge and other comments provided by the Indian Tribe or NHO, recognizing they are uniquely suited to inform those decisions. There are no limitations on what may constitute appropriate mitigation. Efforts to reach consensus on mitigation should prioritize the preferences of Indian Tribes or NHOs in relation to historic properties of religious and cultural significance to them. Mitigation options should not be classified as "creative," "alternative," or "compensatory," where those terms could constrain resolution.

4. **Agreement Documents and Program Alternatives**. Section 106 agreement documents and program alternatives that relate to or include the identification of, assessment of effects to, or resolution of adverse effects to historic properties of religious and cultural significance to an Indian Tribe or NHO should include language or stipulations that address the role of Indigenous Knowledge in informed decision making and how designated representatives will be involved in any ongoing reviews and consultation.

5. **Compensation**. Indigenous Knowledge is a distinct form of expertise that cannot be supplanted through other forms of knowing. Designated representatives of Indian Tribes or NHOs are the appropriate subject matter experts with the experience and qualifications to inform federal agency decision making. In many cases, acquiring, vetting, and deciding whether and how to share Indigenous Knowledge requires research, work, or additional action on the part of the Indian Tribe or NHO. If a federal agency requests an Indian Tribe or NHO provide Indigenous Knowledge via research, survey, monitoring, or other efforts that are the responsibility of the federal agency under the NHPA, the Indian Tribe or NHO should be reimbursed or compensated.[9]

6. **Administrative Record.** Any determination, finding, or agreement that relates to the identification of or assessment of effects to properties that may be of religious and cultural significance to an Indian Tribe or NHO should include sufficient documentation to enable any reviewing party to identify when and how consultation efforts facilitated opportunities for Indigenous Knowledge to inform decision making. These records should also reflect if and how Indigenous Knowledge was incorporated into final decisions, or include justifications as to why not, being cognizant to protect or withhold information deemed sensitive by the Indian Tribe or NHO in accordance with applicable law, regulation, and agency policy.

7. **Consultation Timelines**. The Section 106 implementing regulations set the minimum standards for federal agency interactions with consulting parties, including Indian Tribes and NHOs. When seeking information from an Indian Tribe or NHO regarding properties that may be of religious and cultural significance to them, the agency official must ensure the consultation is initiated early in the planning process and the federal agencies should provide as much advanced notice of consultation meetings as possible and should extend review timelines accordingly, where appropriate. Timelines should reflect the complexity and nature of the undertaking and should recognize and attempt to accommodate internal decision-making processes of associated Indian Tribes and NHOs.

8. **Protocols and Processes.** The preservation community should seek to develop or update policy, guidance, or other technical resources that inform stewardship and other cultural resources management actions, including under Sections 106 and 110 of the NHPA and Executive Order 13007: Indian Sacred Sites, and as a part of other relevant actions, to account for the role that Indigenous

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[9] Consistent with ACHP's Guidance on Assistance to Consulting Parties in the Section 106 Review Process, when the federal agency (or in some cases the applicant) seeks the views and advice of any consulting party in fulfilling its legal obligation to consult with them, the agency or applicant is not required to pay that party for providing its views. Federal agencies should also identify compensation mechanisms consistent with the Executive Order on Reforming Federal Funding and Support for Tribal Nations to Better Embrace Our Trust Responsibilities and Promote the Next Era of Tribal Self Determination which directs all federal agencies to better live up to the federal government's trust responsibilities and support Tribal self-determination by reforming federal funding programs that support Tribes.

Knowledge should have in decision making. These resources should be developed in consultation with Indian Tribes and NHOs and should account for applicable principles identified in this policy.

9. **Professional Qualifications**. The ACHP recognizes Indian Tribes, as sovereign Nations, have the right to determine who has the expertise and is qualified to represent them and their Indigenous Knowledge in the Section 106 process. Consistent with departmental procedures, the ACHP recommends that the Department of the Interior pursue amendments to the Secretary of Interior's Professional Qualification Standards to identify the designated representatives of Indian Tribes and NHOs as subject matter experts who meet the professional standards needed to inform findings and determinations relevant to properties that may be of religious and cultural importance to them.

10. **Acquisition and Handling of Sensitive Information**. Indigenous Knowledge frequently includes information that is sensitive, sacred, or internal to an Indian Tribe or NHO. The potential acquisition of Indigenous Knowledge should consider not only how it would influence decision making, but also how it would account for any cultural, governmental, legal, or moral protocols that dictate its application and use. If Indigenous Knowledge is acquired, maximum effort should be taken to limit the inappropriate disclosure of confidential or sensitive information through all available mechanisms.

11. **Sacred Sites.** Locations identified as sacred sites by Indian Tribes or NHOs may also be historic properties of religious and cultural significance under the NHPA. The responsibility to consider access to and protection of sacred sites, consistent with Executive Order 13007: Indian Sacred Sites, is separate from and in addition to an agency's Section 106 review for any proposed undertakings. In developing and implementing procedures pursuant to Executive Order 13007, federal agencies should incorporate consultation with designated representatives of the associated Indian Tribes and NHOs and integrate their Indigenous Knowledge to inform the identification of, protection of, and access to these sites.

12. **United Nations Declaration on the Rights of Indigenous Peoples.** The ACHP recognizes the significance and importance of the Declaration[10] and the support it conveys for Indigenous Knowledge.[11] This policy is intended to work in concert with applicable provisions of the Declaration. While the Declaration is not legally binding, federal agencies can look to it for policy guidance in carrying out their historic preservation responsibilities including in the Section 106 context and in with respect to sacred sites. Because the Declaration was developed with input from Indigenous Peoples around the world, it stands as a guide to what is important to Indigenous Peoples, above and beyond basic human rights. The ACHP suggests that federal agencies, state and local governments, and nongovernmental institutions, including private contractors, consider the Declaration a reference to help inform the outreach, consultation, and consideration of Indigenous Knowledge.[12]

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[10] In 2010 the United States announced its support of the United Nations Declaration on the Rights of Indigenous Peoples (Declaration) and in 2013 the ACHP took the bold step to adopt a plan to support the Declaration. This plan included the commitment to incorporate language and principles from the Declaration in future ACHP policy and program initiatives regarding the protection and preservation of historic properties of religious and cultural significance to Indian Tribes, NHOs, and other Indigenous Peoples to improve federal agency Section 106 consultation with Indian Tribes and NHOs. See ACHP's webpage on the Declaration and ACHP's Burial Sites Policy: Guidance and Information document for examples

[11] "Indigenous peoples have the right to practice and revitalize their cultural traditions and customs. This includes the right to maintain, protect and develop the past, present and future manifestations of their cultures, such as archaeological and historical sites, artefacts, designs, ceremonies, technologies and visual and performing arts and literature," Article 11, United Nations Declaration on the Rights of Indigenous Peoples.

[12] Article 18 of the Declaration has identified that the right of an individual or associated community to "participate in decision-making in matters which would affect their rights, through representatives chosen by themselves in accordance with their own procedures, as well as to maintain and develop their own decision-making instructions," is a basic human right; Article 31 of the Declaration states that "indigenous peoples have the right to maintain, heritage, traditional knowledge and traditional cultural expressions...They also have the right to maintain, control, protect and develop their intellectual property over such cultural heritage, traditional knowledge, and traditional cultural expressions." Working with Indigenous Peoples, governments "shall take effective measures to recognize and protect the exercise of these rights."

IMPLEMENTATION OF THE POLICY. Implementation of this policy statement is primarily the responsibility of ACHP leadership and staff. However, the ACHP recognizes that the appropriate expertise and experience to ensure effective implementation of this policy will require participation from the broader preservation community, including ongoing consultation and collaboration with Indian Tribes, Native Hawaiians, and other Indigenous Peoples.

Consistent with the ACHP's statutory authority to advise the President, Congress, and state and local governments on historic preservation, and to make recommendations to federal agencies to improve their preservation programs, the ACHP calls on federal agencies, state and local governments, and nongovernmental institutions, including private contractors, to advance the principles in this policy consistent with their unique mission, scope, and authorities.

The ACHP commits to advancing consideration of Indigenous Knowledge in conjunction with the broader preservation community, Indian Tribes, Native Hawaiians, and other Indigenous Peoples through the following:

A. Train ACHP staff regarding the implementation of this policy.
B. Develop guidance and informational resources that further inform the application and intent of this policy.
C. Seek opportunities to implement applicable policy principles into Section 106 agreement documents and program alternatives.
D. Advise federal agencies, state and local governments, Indian Tribes, Tribal and State Historic Preservation Officers, and NHOs in their development of historic preservation protocols, if invited.
E. Encourage federal agencies and other relevant parties to give full and meaningful consideration to Indigenous Knowledge consistent with this policy statement.
F. Participate on interagency working groups, including through the White House Council on Native American Affairs and the National Science and Technology Council Subcommittee on Indigenous Knowledge, to advance Indigenous Knowledge through an all-of-government approach.

DEFINITIONS. The definitions provided below are intended to be inclusive and are meant to inform the application of this policy statement. However, many terms require the input of associated parties to more fully understand how to interpret or apply each term.

- **Confidential**: Information that is protected by law, regulation, or federal policy. Preserving authorized restrictions on information access and disclosure, including means for protecting personal privacy and proprietary information
- **Consultation**: The process of seeking, discussing, and considering the views of other participants and, where feasible, seeking agreement with them.[13] A foundational activity in the Section 106 review process.
- **Consulting Parties**: Persons or groups the federal agency consults with during the Section 106 process. They may include the State Historic Preservation Officer; Tribal Historic Preservation Officer; Indian Tribes and Native Hawaiian organizations; representatives of local governments; applicants for federal assistance, permits, licenses, and other approvals; and/or any additional consulting parties.[14]Additional consulting parties may include individuals and organizations with a demonstrated interest in the undertaking due to the nature of their legal or economic relation to the undertaking or affected properties, or their concern with the undertaking's effects on historic properties.[15]

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[13] 36 CFR § 800.16(1).
[14] 36 CFR § 800.2(c).
[15] 36 CFR § 800.2(c)(6).

- **Designated Representative:** Individual(s) authorized by an Indian Tribe or Native Hawaiian organization's governing body, or other authorized person, to represent the Tribal government or NHO or act on its behalf.
- **Historic Property**: Any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. It includes artifacts, records, and remains that are related to and located within such properties, and it includes properties of traditional religious and cultural importance to an Indian Tribe or Native Hawaiian organization and that meet the National Register of Historic Places criteria.[16]
- **Indian Tribe:** An Indian Tribe, Band, Nation, or other organized group or community, including a Native Village, Regional Corporation or Village Corporation, as those terms are defined in Section 3 of the Alaska Native Claims Settlement Act,[17] which is recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians.[18]
- **Native Hawaiian**: Any individual who is a descendant of the aboriginal people who, prior to 1778, occupied and exercised sovereignty in the area that now constitutes the state of Hawaii.[19]
- **Native Hawaiian organization (NHO)**: Any organization which serves and represents the interests of Native Hawaiians; has as a primary and stated purpose the provision of services to Native Hawaiians; and has demonstrated expertise in aspects of historic preservation that are significant to Native Hawaiians.[20]
- **Section 106**: That part of the NHPA which establishes federal-agency responsibility to take into account the effects of undertakings on historic properties and to provide the ACHP a reasonable opportunity to comment with regard to such action. (54 U.S.C. §306108)
- **Sensitive**: Information that may be protected by law, regulation, or federal policy; information that may be identified as sensitive by the sponsoring entity/original source and considered inappropriate for public disclosure.

January 11, 2024

[16] 36 CFR § 800.16(1).
[17] 43 U.S.C. § 1602.
[18] 36 CFR § 800.16(m).
[19] 54 USC 300313.
[20] 36 CFR § 800.16(s)(1).

Dear Imperial County,

My name is Kristian Salgado and I'm a resident of Imperial County that lives in the city of Calexico. As a community member I have sat for several years on two air quality related boards in Imperial County – Air District Hearing Board and AB617 Community Steering Committee. In both these roles I have seen first-hand the growth, over the past 5 years, our county (Air District) and state government (CARB) has taken to better monitor and improve ambient air quality (ex. particulate matter -PM10 and PM2.5) through mitigation efforts in our region. With the new development of "Lithium Valley" in the foreseeable future air quality concerns should be ***high*** on the list of environmental priority when concern land use purposes, especially the communitive impacts to our region, and the direct impact to the northern communities in the county closest to the project. For example,

- If a large percentage (17,626 acres) of the lands-use purpose will be designated for "green industry use" which will potential allow for the future development of more geothermal plants now with lithium facilities adjacent to them. A comprehensive baseline history and assessment of all the current geothermal plants should be evaluated comprehensively for air quality impacts on a micro and macro level (PM10, PM2.5, Carbon Dioxide, Methane). As a concern resident I wonder if the county should limit the number of Air Permits or (land permitting this use) for geothermal development in the region based on their accumulative air quality impact.
- The increase level of vehicle traffic (industrial and public) to north end of the county CARB should monitor the impacts to the area.
- The cumulative health risks of concentrations and emissions of hydrogen sulfide, benzene, mercury, and radon on employee and surrounding population.

I'm deeply concerned, and I feel strongly that they should be studied extensively during the Programmatic Environmental Impact Report conducted on the lithium related developments near the Salton Sea.

Thank you,

Kristian Salgado

February 20, 2024

Director Jim Minnick
Imperial County Planning & Development Services Department,
801 Main Street
El Centro, CA 92243

Sent via email

RE: NOTICE OF PREPARATION OF DRAFT PROGRAMMATIC EIR FOR THE LITHIUM VALLEY SPECIFIC PLAN

Dear Director Minnick,

The undersigned organizations respectfully submit the following comments in response to the Notice of Preparation of the draft Programmatic Environmental Impact Report (EIR) for the Lithium Valley Specific Plan.

Leadership Counsel for Justice and Accountability has advocated alongside residents of the Eastern Coachella Valley (ECV), which includes the unincorporated communities of Thermal, Mecca, Oasis, and North Shore, to identify and advocate for measures that enhance air quality, bolster climate resilience, improve water quality, ensure energy reliability, and elevate the overall quality of life in the region, among other priorities. With partner organizations extending beyond the ECV, this letter represents the concerns of organizations working throughout the Salton Sea region from the Southern Border of Calexico to the Coachella Valley.

The vague and ambiguous description of the Lithium Valley Specific Plan (Plan), which encompasses unspecified developments within the Specific Plan Area (SPA) such as the continued development of "renewable energy and related industries including the extraction, refinement and manufacturing use of lithium" raises significant concern.[1] It is inappropriate and irresponsible to complete an assessment that encompasses various indefinite and unspecified

[1] California Governor's Office of Planning and Research. (December 2023). Initial Study Imperial County Lithium Valley Specific Plan. https://files.ceqanet.opr.ca.gov/293418-1/attachment/E3f8TOUtzLRvU5g3BM31wQq-4ic5MD5SwgYVXg3QYx41n1ytItuL70sQ_ZkJnuznpnArgMDiXeM5qorf0

components. For example, the Specific Plan determines that "Allowed uses may include, but not limited to geothermal energy production and mineral recovery, biofuel generation, and green hydrogen". The inclusion of biofuel generation and green hydrogen raises additional environmental justice concerns and areas for review, such as emissions, high freshwater requirements, and potential grid impacts, and would need separate EIRs to address and should be excluded from consideration in the EIR. This ambiguous language is especially concerning given the continuous uncertainty and lack of information regarding the potential impacts of Direct Lithium Extraction (DLE).

It is vital that each individual project within this Plan, whether or not completing the same function, must undergo an individual rigorous environmental review rather than a streamlined process. This approach is especially important to ensure that the nuanced and site-specific environmental impacts associated with lithium extraction and other related projects are adequately addressed and mitigated. In the case that the Plan moves forward, to avoid more harm to the surrounding communities and ensure an accessible public process we recommend the following.

Project Phases and Components

While DLE is restricted within the Salton Sea Known Geothermal Resource Area (SSKGRA), there must be an acknowledgment of the potential broader implications for communities across the Salton Sea region. Residents have continuously raised concerns regarding potential impacts on the Salton Sea, air, water, soil, energy, and other climate-related issues that will further hinder their resiliency to the climate crisis. Additionally, the unclarity around the details of this Plan raises concerns on the potential for further industrial development outside of the SSKGRA and into the ECV including the development of manufacturing facilities and other related industries.

It is imperative to detail a comprehensive outline of the specific projects encompassed within the Plan, ensuring that the Plan's scope is confined to the projects explicitly listed. Furthermore, there must be a delineation of the projects that will make up Phase 1 and other subsequent phases. This must include an assessment of the potential impacts of each of these phases and projects within it individually and in relation to each other.

The description of the different phases and components within them must also include details on the required additional permits and permitting process including a description of the responsible entities and public process. Finally, there must be a clear distinction of when and how necessary additional Environmental Impact Reports must be identified and completed.

CEQA Requires a Full Evaluation of Project Impacts

The purpose of CEQA is to ensure that a lead agency fully evaluates, discloses, and, whenever feasible, mitigates a project's significant environmental effects. Pub. Resources Code, §§ 21000-21002.1. An EIR serves as an "informational document" that informs the public and decision makers of the significant environmental effects of a project and ways in which those effects can be minimized. CEQA Guidelines, § 15121, subd. (a). An EIR must clearly set forth all significant effects of the project on the environment. Pub. Resources Code, § 21100, subd. (b)(1); CEQA Guidelines, § 15126.2, subd. (a) (emphasis added). Below are some, but not all of the impacts that must be analyzed, assessed, and fully mitigated in this Project's EIR.

Air Quality & Greenhouse Gases

There must be a thorough assessment of the region's air quality including identification of sources and the cumulative impact they have had on the environment and community in the region. Any potential impact must be coupled with extensive mitigation efforts that go beyond further assessment and instead focus on action that ensures no more harm to communities in the region and are developed in collaboration with these same communities.

The Salton Sea Air Basin (SSAB) is composed and overseen by two counties, Riverside County and Imperial County, and two air districts, South Coast Air Quality Management District and Imperial County Air Pollution Control District together encompassing the Coachella Valley and Imperial Valley. The region as a whole according to State Ambient Air Quality Standards, is classified as nonattainment areas for both Ozone and PM10.[2] Additionally, the Coachella Valley falls into nonattainment for PM2.5.[3] Similarly, in terms of the National Ambient Air Quality Standards, both valleys are in nonattainment status for 8-hour ozone, while the Coachella Valley is also in nonattainment for PM10.[4] Additionally, the Coachella Valley is currently designated as "extreme" nonattainment for the 1997 8-hour ozone standard, with plans from the South Coast Air Quality Management District to seek reclassification to "extreme" for the 2015 8-hour ozone standard.[5]

[2] *California Air Resources Board*. Maps of State and Federal Area Designations | California Air Resources Board. (n.d.). https://ww2.arb.ca.gov/resources/documents/maps-state-and-federal-area-designations
[3] Ibid
[4] Ibid
[5] South Coast Air Quality Managment District. September 2022. Draft Staff Report, Request to Reclassify Coachella Valley for the 2008 8-Hour Ozone Standard and the Updated Motor Vehicle Emissions Budgets. https://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2022-air-quality-management-plan/cv-mveb/coachella-valley-reclassification-for-the-2008-8-hour-ozone-standard-and-mveb---draft-staff-report.pdf?sfvrsn=8

The communities to the west and east of the SPA have been identified as AB 617 [6] communities under the California Air Resources Board's (CARB) Community Air Protection Program.[7] This program aims to mitigate air emissions exposure and enhance overall air quality in communities most adversely affected by poor air quality signifying that the communities surrounding the SPA are among those most severely impacted by poor air quality.

In 2018, the El Centro-Heber-Calexico Corridor in Imperial County, to the south of the SPA, was designated as an AB 617 community due to significant impacts from various factors including agricultural activities, concentrated animal feeding operations, off-road equipment, on-road vehicles, unpaved roads, industrial energy production, off-highway vehicles, and regional wind events.[8] Similarly, in 2019, the Eastern Coachella Valley in Riverside County, located north of the SPA, was designated as an AB 617 community primarily due to impacts related to the Salton Sea, pesticides, fugitive dust and off-roading, open burning and illegal dumping, diesel mobile sources, and the Greenleaf Desert View Power Plant.[9]

Given the current air quality in the region and the historical impacts it has had on the communities and environment within it, this analysis must include a comprehensive understanding of the region's conditions and all potential factors in this Plan that could further impact air quality and their subsequent respective impacts. For example, while geothermal plants, which are connected to possible DLE, predominantly release steam into the air, they also emit gases such as hydrogen sulfide, ammonia, and carbon dioxide which are subject to heavy regulation and comparable to natural sources like the Salton Sea[10] which has had severe negative public health impacts on the communities in the region.[11] Furthermore, the Energy Source MineralATLiS Project's (ES Minerals) use of hydrochloric acid (HCl) in the mineral extraction process raises concerns about hazardous air emissions. They estimate releasing 7,440 pounds per year of HCl aerosols, below the 10,000 pounds per year reporting threshold.[12] However, exposure to HCl can lead to a range of health impacts, including respiratory difficulties. It is probable that other lithium projects will also utilize HCl.

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[6] *Bill text*. Bill Text - AB-617 Nonvehicular air pollution: criteria air pollutants and toxic air contaminants. (n.d.). https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180AB617
[7] *California Air Resources Board*. Community Air Protection Program | California Air Resources Board. (n.d.). https://ww2.arb.ca.gov/capp
[8] Calexico, El Centro, Heber. (n.d.). https://ww2.arb.ca.gov/our-work/programs/community-air-protection-program/communities/calexico-el-centro-hebr
[9] South Coast Air Quality Management District (n.d). CERP Archive - Eastern Coachella Valley (ECV). https://www.aqmd.gov/nav/about/initiatives/environmental-justice/ab617-134/eastern-coachella-valley/cerp-archive
[10] Lawrence Berkeley National Laboratory. (2023).Characterizing the Geothermal Lithium Resource at the Salton Sea. https://escholarship.org/uc/item/4x8868mf.
[11] University of California, Riverside. (2023, June 1). Salton Sea Environment Detrimental to Respiratory Health of Local Children. UCR News. https://news.ucr.edu/articles/2023/06/01/salton-sea-environment-detrimental-respiratory-health-local-children
[12] California Governor's Office of Planning and Research. (n.d.). Energy Source Mineral ATLiS Project . CEQA Document. https://ceqanet.opr.ca.gov/2020120143/2

In terms of greenhouse gases (GHG), there must be a consideration of local, state, and federal GHG reduction plans. Any action that contradicts these initiatives will seriously hinder progress towards climate goals. Examples of these initiatives include CARB's Scoping Plan[13] and the State of California's Priority Climate Action Plan.[14]

Transportation and Heavy-Duty Trucks

The AB 617 community plans for both of these communities include emissions from heavy-duty trucks as a top priority for the region. Given the uncertainty regarding the scope of the projects encompassed in this study, we are concerned about the potential increase in heavy-duty truck operations and their effects on both the communities and the environment. Especially given that previous Environmental Impact Reports (EIR) related to lithium extraction development such as the Hell's Kitchen PowerCo1 and Lithium Co 1 Project[15] (Hell's Kitchen) note the expansion of heavy duty trucks. There must be a holistic understanding of the current heavy-duty truck operations and their impacts on both the communities and the environment, while also considering the additional impact this project will introduce within this context. If projects move forward there must be extensive mitigation efforts to reduce the impacts of such activities.

In terms of GHGs there must be alignment with state vehicle miles traveled (VMT) reduction goals as outlined in the CARB's Scoping Plan. Increases in traffic and transportation activities could contradict these goals, potentially leading to higher emissions.

Energy

The Imperial Irrigation District (IID) serves as the primary energy provider for Imperial County and portions of Riverside County, including all of the ECV which have been continuously affected by power outages, especially during severe weather events which are increasing given the climate crisis. Between 2017 and 2022, the IID's service area, covering Imperial and Riverside County, endured a total of 5,865 power outages lasting an hour or more.[16] Given the region's history of energy reliability challenges and inadequate infrastructure, along with the potential for inefficient energy resource consumption throughout the project's lifespan, the EIR must evaluate energy consumption beyond construction and development. This evaluation should encompass the long-term operational phase, potential increases in energy demand due to

[13] California Air Resources Board. (n.d.). AB 32 climate change scoping plan: 2022 scoping plan documents.https://ww2.arb.ca.gov/our-work/programs/ab-32-climate-change-scoping-plan/2022-scoping-plan-documents

[14] California Air Resources Board. (2024). California Draft CPRG Priority Climate Action Plan as of January 31, 2024.

[15] California Governor's Office of Planning and Research. (n.d.). Hell's Kitchen PowerCo1 and Lithium Co 1 Project . CEQA Document. https://ceqanet.opr.ca.gov/2022030704/3

[16] Imperial Irrigation District. "IID Outage_Report 2017 thru 2022 for Outages lasting 1 hour or longer 06032022.xlsx." June 6, 2022

projected population growth in both the Coachella and Imperial Valley regions, an assessment of the potential ramifications of energy-intensive facilities on the region's energy grid, and the ongoing reliance on external energy sources.

Current energy reliability challenges within the IID underscore the urgent need for a thorough evaluation of the Plan's impact on energy consumption and resource availability. Geothermal operations at the SSKGRA currently depend on electricity purchased from IID. As the project expands, this reliance on IID energy is expected to persist and potentially increase throughout the lifespan of the proposed developments as brine production and power generation from geothermal wells decline over time.[17]

Geology and Soils

The EIR must conduct a comprehensive examination of the potential impact of the proposed developments on seismic activity. This analysis should include a review of historical seismic data, risk assessments, and scientific research to accurately assess the seismic risks associated with the project.

Furthermore, the EIR must carefully scrutinize the proposed earthquake safety standards for the design and construction of proposed developments, including but not limited to lithium extraction facilities. It is imperative that these facilities are adequately designed to withstand seismic events, protect workers, and prevent the release of hazardous materials such as brine and wastes into the environment in the event of a major earthquake. This analysis should include an evaluation of spill prevention and response plans, emergency evacuation procedures, and containment systems to mitigate the risk of environmental contamination during seismic events.

Lastly, the EIR must conduct comprehensive soil testing to assess pesticide contamination on agricultural land where construction activities are proposed. This assessment should involve testing soil samples for a range of pesticides and other contaminants and evaluating potential risks to human health and the environment along with subsequent mitigation measures to safeguard community well-being.

Hazards and Hazardous Materials

The proposed renewable energy developments, including geothermal and lithium extraction facilities, are expected to significantly increase the production and transportation of hazardous materials, emphasizing the critical need for a comprehensive examination in the EIR. This analysis should encompass various aspects, including evaluating the types and quantities of

[17] Comite Civico del Valle, Earthworks. (November 2023). Environmental Justice in California's Lithium Valley, Understanding the potential impacts of direct lithium extraction from geothermal brine, A document for community eduction. https://earthworks.org/wp-content/uploads/2023/10/California-Lithium-Valley-Report.pdf

hazardous waste byproducts anticipated from these developments, along with their disposal methods and potential environmental and community impacts. Furthermore, the EIR must assess and propose mitigation strategies to reduce hazardous material exposure at all stages, spanning from the source to transportation and eventual arrival at waste disposal facilities, while also outlining emergency protocols in the event of toxic waste exposure.

Despite the classification of most geothermal waste as non-hazardous, instances of fines against Berkshire Hathaway Energy Renewables (BHER) operations for mishandling hazardous waste and discharging wastewater with elevated levels of lead, arsenic, and copper into the Salton Sea highlight significant concerns.[18] To eliminate further impacts of hazardous waste disposal on nearby communities, the EIR must provide waste estimates and comprehensive plans for the storage, treatment, and disposal of all potential waste streams. Particularly notable are the potential DLE waste products, such as Iron/Silica filter cake, Calcium/Magnesium filter cake, Boron Ion Exchange, and Manganese/Zinc filter cake, each of which may have varied environmental impacts, including water pollution, hardness, and toxicity to plants and animals. It is imperative that the fate of these waste products is explicitly addressed in the EIR, along with the corresponding environmental impacts and proposed mitigation strategies, which should be extensive and completed in collaboration with the public.

Hydrology and Water

The severe drought conditions and pressing water quality concerns in our region, have led to a number of environmental and social concerns. Therefore, it is imperative that we have a comprehensive understanding of the current circumstances and carefully assess how lithium extraction-related activities, and other projects within this Plan, will impact access to water, water quality and communities.

Unfortunately, we are facing significant data gaps across various important databases for the region. For instance, the United States Geological Survey Data, State Water Board Groundwater Visualization Tool, Groundwater Ambient Monitoring and Assessment program, and California Statewide Groundwater Elevation Monitoring datasets either do not offer relevant information on groundwater contaminants in the region or data available is outdated and many of these data sets do not have dedicated groundwater monitoring wells in the region. Meanwhile, the California Department of Water Resources Sustainable Groundwater Management Act Data Viewer only provides data from two wells.

To address these shortcomings, we urgently need to establish a robust monitoring network to understand the impacts lithium extraction-related activities can have on both groundwater levels and groundwater quality. This includes installing monitoring wells to track groundwater

[18] Ibid

depletion, groundwater storage change, assess its impact on groundwater quality, and monitoring land subsidence issues. Additionally, obtaining extraction reports is essential to monitoring the amount of groundwater extraction taking place and monitoring any potential impacts associated with groundwater extraction. While evapotranspiration data is useful initially, this should not replace mandatory metering and extraction reports.

There is a potential for these activities to substantially decrease groundwater supplies or interfere with groundwater recharge. The activities are located in a low-priority subbasin, so we have no Groundwater Sustainability Plan (GSP) to reference for general data on groundwater in the region. Depletion of groundwater presents multiple issues, including loss of groundwater storage, land subsidence, and increased levels of pollutants like nitrates and arsenic. Most impacts would likely be heaviest on domestic wells, small water systems, and community water systems that rely solely on groundwater. Additionally, groundwater depletion can have direct impacts on land subsidence which can impact civil infrastructure, such as septic systems and roads. Land subsidence can also have major impacts on water infrastructure like canals, therefore, any potential impacts on Imperial canals must be considered.

Relevant information must be gathered before making a decision regarding the potential impacts of lithium extraction activities on water and hydrology in the region, making a decision before having this information would be premature and irresponsible.

More alarming, the available data, including this Initial Report, show that lithium extraction activities pose a significant risk of adverse impacts. For example, geothermal plants require fresh water to compensate for evaporation losses, and the additive lithium extraction mechanism can significantly increase water consumption. Furthermore, each ton of lithium carbonate production requires approximately 9,400 gallons of water.[19] ES Minerals estimates their operations will consume 3,400 acre-feet of water annually to produce 19,000 metric tons of lithium hydroxide per year over a 30-year lifespan.[20] Similarly, Controlled Thermal Resources estimates their Hell's Kitchen project will use 6,700 acre-feet of water per year to produce 25,000 metric tons of lithium hydroxide annually.[21] IID has reserved up to 25,000-acre feet of water per year for non-agricultural use, potentially supplying proposed lithium projects. However, according to the Lithium Valley Commission, the projected lithium production of 210,000 metric tons of Lithium Carbonate Equivalent (LCE) annually would exceed available non-agricultural water supply as currently planned by IID.[22]

Salton Sea

[19] Ibid
[20] Ibid
[21] Ibid
[22] Ibid

In 1983, the California Supreme Court in National Audubon Society v. Superior Court of Alpine County, 33 Cal.3d 419 (1983) confirmed the well-established rule that, under California's Public Trust Doctrine, the state "owns all of its navigable waterways and the lands lying beneath them as trustee of a public trust for the benefit of the people." The Public Trust Doctrine is not a mere declaration of the state's right to use public property for public purposes: "it is an affirmation of the duty of the state to protect the people's common heritage of streams, lakes, marshlands and tidelands, surrendering that right of protection only in rare cases when the abandonment of that right is consistent with the purposes of the trust."[23]

In resolving the inherent conflicts between California's constitutional and statutory water rights system and the state's Public Trust Doctrine trustee responsibilities, the National Audubon Court established the following principles to guide its decision:

> The state has an affirmative duty to take the public trust into account in the planning and allocation of water resources, and to protect public trust uses whenever feasible. . . . As a matter of practical necessity the state may have to approve appropriations despite foreseeable harm to public trust uses. In so doing, however, the state must bear in mind its duty as trustee to consider the effect of the taking on the public trust, and to preserve, so far as consistent with the public interest, the uses protected by the [Public Trust Doctrine].

National Audubon, supra, 33 Cal.3d at p. 445-446.

The Salton Sea, as a natural terminus of the Colorado River, which held navigable waters before, after, and at times contemporaneous with California's statehood, qualifies under traditional standards as a Public Trust Doctrine resource. Past statements that the Salton Sea is not a Public Trust Doctrine resource have mischaracterized the Sea's history and geomorphology. But in addition to meeting the traditional "equal footing" standard for Public Trust Doctrine status, the Salton Sea enjoys Public Trust Doctrine status as an incident of Mexican law, and Mexico's cession of California to the United States under the 1848 Treaty of Guadalupe Hidalgo.

Furthermore, the Public Trust doctrine has recently been applied to groundwater where there is a hydrological connection between the groundwater and a navigable surface water body.[24] In Environmental Law Foundation v. State Water Resources Control Board ("ELF"), the court held that the public trust doctrine applies to "the extraction of groundwater that adversely impacts a navigable waterway".[25]

As currently written, the NOP fails to adequately consider the impacts this project will have on the Salton Sea and is at risk of violating the Public Trust Doctrine. The degradation of the Salton

[23] *National Audubon Society v. Superior Court of Alpine County*, 33 Cal.3d 419 (1983)
[24] Environmental Law Foundation v. State Water Resources Control Bd. (2018) 26 Cal.App.5th 844, 844.
[25] Id. at 856-62.

Sea is a significant concern not only because of the potential continued shrinkage of the sea as a result of water diversion from agriculture to the projects within this Plan but also because of the Plans potential heavy dependence on groundwater extraction near the Salton Sea. A comprehensive hydrologic study that considers the changes in drainage patterns and their potential effects on local hydrology, including discharges to the Salton Sea, would be necessary to evaluate the Plan's impact on flood flows accurately Additionally, this study should consider the impacts the depletion of groundwater can have on Salton Sea water levels. A comprehensive hydrologic study on Salton Sea impacts must be conducted before any decisions regarding the project can be made.

Furthermore, the long-term impacts of the receding Salton Sea on the region's air quality cannot be overlooked, given the continuous exposure of its highly contaminated lakebed, which generates airborne contaminants. The emissions of dust from the exposed lakebed significantly contribute to elevated contamination levels in the surrounding communities, severely impacting the health and quality of life of residents.[26]

Noise & Vibration

The EIR must evaluate the noise impacts of the proposed developments on nearby residents and local wildlife species, considering the vicinity of the proposed area to neighboring communities. This analysis should encompass assessing existing ambient noise levels to establish a baseline for comparison with projected noise levels from the proposed developments. This should include the use of advanced noise propagation modeling techniques which allow for predicting how noise generated by construction and operational activities will propagate through the surrounding environment.

Furthermore, the analysis should consider cumulative noise impacts by examining the combined effects of noise from the proposed developments along with other existing and planned noise sources in the area, such as transportation infrastructure and industrial facilities. Additionally, temporal noise patterns should be analyzed to understand variations in noise levels throughout the day, week, and year, which can significantly impact community health, sleep patterns, and overall quality of life.

By conducting a thorough examination of noise impacts and proposing appropriate mitigation measures such as noise barriers, sound insulation, and operational controls, the EIR can provide valuable insights into safeguarding the well-being of both communities and wildlife in and near

[26] University of California, Riverside. (2023, June 1). Salton Sea Environment Detrimental to Respiratory Health of Local Children. UCR News.
https://news.ucr.edu/articles/2023/06/01/salton-sea-environment-detrimental-respiratory-health-local-children

the SPA.

Land Use and Housing

It is imperative to conduct a robust analysis of the impacts on land use and planning stemming from the proposed developments as they relate to the SSKRGA and the Salton Sea region as a whole including the ECV. Given the potential development of a localized supply chain across the region, consisting of various components and forms of industrial development, it is concerning that such development across the region will increase the risk of potential impacts.

The Attorney General's warehouse guidelines should be incorporated as part of the EIR's mitigation measures.[27] These guidelines were developed to assist lead agencies in pursuing California Environmental Quality Act (CEQA) compliance and promoting environmentally-just development. It is essential to emphasize that streamlining should not compromise the rigorous CEQA review process. Therefore, we urge a thorough examination of these factors in the EIR to provide a comprehensive understanding of the impacts on land use and planning across the region including Riverside and Imperial County.

Additionally, the EIR must include a thorough analysis of population and housing impacts associated with the proposed developments, considering several key factors. Firstly, the Plan could potentially induce substantial unplanned population growth near the SPA and even further out in Riverside County, necessitating careful examination to mitigate adverse effects. Imperial County needs a comprehensive plan to accommodate this growth, lower vehicle miles traveled (VMT), and address housing shortages. Moreover, the potential for displacement due to increased air pollution and other quality of life issues must be thoroughly assessed and mitigated.

By conducting a comprehensive analysis of population and housing impacts and adhering to relevant county regulations and plans, the EIR can help ensure that the proposed developments contribute positively to the community while minimizing adverse effects on population, housing, and quality of life.

* * * * *

In closing, an EIR that includes various unspecified components is inappropriate and irresponsible. We strongly recommend that each project go through an individual EIR process. Please contact Krystal Otworth at kotworth@leadershipcounsel.org for any inquiries.

Sincerely,

[27]California Department of Justice, Office of the Attorney General. (n.d.). Warehouse Best Practices. https://oag.ca.gov/system/files/media/warehouse-best-practices.pdf

Krystal Otworth
Policy Advocate
Leadership Counsel for Justice & Accountability

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Gracyna Mohabir
Clean Air & Energy Regulatory Advocate
California Environmental Voters & California Environmental Voters Education Fund

Joan Taylor
Vice Chair
Sierra Club's California/Nevada Desert Committee

CC

Honorable Steven S. Cliff, Ph.D.
Executive Office
California Air Resources Board

Wade Crowfoot
Secretary of the California Natural Resources Agency

California Natural Resources Agency

Samantha Arthur
Assistant Secretary for Salton Sea Policy
California Natural Resources Agency

Eric Oppenheimer
Executive Director
State Water Resources Control Board

E. Joaquin Esquivel
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State Water Resources Control Board

Drew Boham
Executive Director
California Energy Commission

Noemi O. Gallardo
Commissioner
California Energy Commission

Wayne Nastri
Executive Office
South Coast Air Quality Management District

Jamie Asbury
General Manager
Imperial Irrigation District

From: Diana Robinson
To: Matthew Valerio
Cc: Jim Minnick; Michael Abraham; Shannon Baer; Brian Mooney
Subject: Fwd: Follow-up email
Date: Tuesday, February 20, 2024 6:15:03 PM

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From: Lena Ortega <lenaortega49@icloud.com>
Sent: Tuesday, February 20, 2024 5:13 PM
To: Rebecca Terrazas-Baxter <RebeccaTerrazas-Baxter@co.imperial.ca.us>
Cc: culturalcommittee@quechantribe.com <culturalcommittee@quechantribe.com>; MANFRED SCOTT <scottmanfred@yahoo.com>; ernestinekahika2009@gmail.com <ernestinekahika2009@gmail.com>; Diana Robinson <DianaRobinson@co.imperial.ca.us>; Jim Minnick <JimMinnick@co.imperial.ca.us>; Evelia Jimenez <EJimenez@co.imperial.ca.us>; Rocio Yee <rocioyee@co.imperial.ca.us>; J SA <swiftarrowj@gmail.com>
Subject: Re: Follow-up email

Dear Mr. Minnick and Staff,

I hope this email finds you well. I am writing on behalf of the Kw'tsán Cultural Committee in response to the Notice of Preparation of DRAFT Program EIR for the Lithium Valley Specific Plan and the accompanying Notice of Public Scoping Meeting, as issued by the Imperial County Planning and Development Services Department.

Having thoroughly reviewed the documents pertaining to the Lithium Valley Specific Plan, particularly the environmental factors outlined on page 10, we express our deep concerns regarding the potential and continuous environmental damage that may result from the proposed construction in the specified area. We acknowledge the importance of development projects but firmly believe that they should not compromise the integrity of the environment and the cultural significance of the lands in question.

Regrettably, due to time constraints and limited resources within the Kw'tsán Cultural Committee, we have not been able to submit a formal request for consultation. Our lack of a Historic Preservation Officer (HPO) further complicates our ability to engage in a more timely manner.

It is disheartening to note that despite these concerns and limitations, we understand that the project is still set to proceed. At this time, we have no additional comments to add.

Thank you for your attention to this matter, and we appreciate your understanding.

Sincerely,

Lena Ortega
Kw'tsán Cultural Committee Member

On Jan 12, 2024, at 11:19 AM, Rebecca Terrazas-Baxter <RebeccaTerrazas-Baxter@co.imperial.ca.us> wrote:

Good morning all:

First and foremost, I would like to take this opportunity to once again thank you for taking the time to meet with us yesterday to discuss the Lithium Valley Programmatic Environmental Impact Report project and other Lithium Valley initiatives, projects, and activities that are currently in progress by the County of Imperial.

I also wanted to follow up to some of the items we discussed.

As promised, here is the contact information for the main points of contacts at the California Energy Commission regarding geothermal and lithium development in Imperial County.

Noemi Gallardo, Commissioner, California Energy Commission, Noemi.gallardo@energy.ca.gov
Erik Stokes, Chief of Staff to Commissioner Gallardo, California Energy Commission, Erik.stokes@energy.ca.gov

Additionally, I will reach out to IVC regarding the interests of having a designated number of slots available in their new lithium focused certification program for tribal members.

I will also reach out to CTR and other developers in the Salton Sea area to inform them of your request to tour their facilities and encourage them to accommodate the request with the hopes that a tour is scheduled in the near future.

Ernestine, I will also send a separate email to connect you with our Air Pollution Control District so we can share your ideas about expanding the outreach related to the air quality flag program in the Winterhaven / Quechan Tribe reservation area.

Lastly, please let me know which of you are interested in the landfill tour, as was mentioned during yesterday's meeting, so that we can share that request with Berkshire Hathaway.

Again, thank you for your time and attention We look forward to continuing this relationship and dialogue to learn from each other.

Best wishes,
Becky

Please excuse any grammatical errors as this was sent from my iPhone.

Rebecca Terrazas-Baxter
Assistant County Executive Officer
County of Imperial
940 West Main Street, Suite 208
El Centro, CA 92243
Direct: (442) 265-1014
Mobile: (760) 791-7645

www.imperialcounty.org

Keegan Kingsbury

From: Jim Minnick <JimMinnick@co.imperial.ca.us>
Sent: Monday, February 12, 2024 1:39 PM
To: Matthew Valerio; Shannon Baer; Brian Mooney
Cc: Rosa Soto; Diana Robinson; Michael Abraham
Subject: FW: Lithium Valley Program EIR scoping comment

Matt,

Below is a NOP comment for the PEIR.

Jim

From: Jim Minnick
Sent: Monday, February 12, 2024 1:39 PM
To: Linda Martin <linda@lindamartindesign.com>
Subject: RE: Lithium Valley Program EIR scoping comment

Ms. Martin,

Thank you for your comments we will make sure our environment consultants receive them.

Jim Minnick
Director
ICPDS

801 Main Street
El Centro, CA 92243
(442)-265-1736
jimminnick@co.imperial.ca.us

From: Linda Martin <linda@lindamartindesign.com>
Sent: Monday, February 12, 2024 1:11 PM
To: Jim Minnick <JimMinnick@co.imperial.ca.us>
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore,

please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

This analysis should carefully consider cumulative impacts on the entire Imperial County Air Pollution Control District, which is already severely degraded. Any worsening air quality would significantly impact public health and likely exceed legal thresholds, which must be analyzed and mitigated. Given these concerns, please consider a project alternative requiring no reduced inflow to the Salton Sea.

Thank you.

Sincerely,
Linda Martin
1210 Green Garden Dr Unit 2
El Cajon, CA 92021

United States Department of the Interior
U.S. FISH AND WILDLIFE SERVICE
Ecological Services
Palm Springs Fish and Wildlife Office
777 East Tahquitz Canyon Way, Suite 208
Palm Springs, California 92262

In Reply Refer to:
2024-0046381-CEQA-001-IMP

February 20, 2024
Sent Electronically

Jim Minnick
Director
Imperial County Planning and Development Services Department
801 Main Street
El Centro, California 92243

Subject: Notice of Preparation of a Program Environmental Impact Report for the proposed Lithium Valley Specific Plan, Imperial County, California

Dear Jim Minnick:

This letter is in response to your correspondence dated December 7, 2023, which we received via email, soliciting our agency's comments on possible effects the Lithium Valley Specific Plan (Specific Plan) might have on the environment and suggestions on alternatives, mitigation, or ways the Specific Plan may be revised to reduce or avoid any significant environmental impacts. Since January 2023, U.S. Fish and Wildlife Service (Service) staff have participated in the Lithium Valley Specific Plan Land Use Development Technical Advisory Group; and as such we have attended several meetings and reviewed the Baseline Study and Alternatives Analysis (Rick Engineering 2023) and provided initial guidance to help Imperial County avoid and minimize adverse impacts on public trust resources.

The intent of the Specific Plan is to provide a framework and guidance for the development of renewable energy sources, such as geothermal and solar energy, lithium extraction, associated industrial uses, and infrastructure improvements, while minimizing adverse effects on the environment and public health. The Specific Plan and associated Program Environmental Impact Report (PEIR) will evaluate land use alternatives to support renewable energy industries that include the necessary facilities and infrastructure within an approximately 51,786-acre area southeast of the Salton Sea. The development in the Specific Plan area is driven by federal and state renewable energy and greenhouse gas reduction goals, with a focus on providing resources for battery-powered vehicles.

Existing land cover in the Specific Plan area consists of various natural communities, including wetlands, riparian areas, desert scrub, and barren/rock outcrop. These habitats provide resources for a variety of wildlife species, including aquatic invertebrates, fish, waterbirds, wading birds, shorebirds, songbirds, reptiles, and mammals. The wetland habitats, agricultural lands, irrigation drains, and Salton Sea shoreline habitats provide nesting, roosting, and foraging habitat for

resident wintering and migratory birds (Rick Engineering 2023). These habitats also support the federally endangered desert pupfish (*Cyprinodon macularius*) and Yuma Ridgway's rail (*Rallus obsoletus yumanensis*). The existing roads in the Specific Plan area generally carry low traffic volumes and human presence is light. These existing road conditions allow for movement of common terrestrial wildlife freely through the Specific Plan Area using the roads and associated shoulders and berms. The Alamo River and New River provide wildlife movement corridors through the Specific Plan area.

We offer the following technical assistance comments as they relate to potential impacts on public trust resources. The primary concern and mandate of the Service is the conservation, protection, and enhancement of fish and wildlife resources and their habitats for the continuing benefit of the American people. We have legal responsibility for the welfare of migratory birds and federally threatened or endangered animals and plants. The comments provided herein are based on our knowledge of sensitive and declining fish and wildlife resources and our participation in regional renewable energy and conservation planning efforts.

The following comments and recommendations are to help Imperial County incorporate policies, programs, or mitigation measures as part of the Specific Plan PEIR to avoid adverse effects to existing biological resources in the Specific Plan area. These recommendations will help avoid and minimize adverse impacts to public trust resources, including migratory birds and the federally endangered desert pupfish and Yuma Ridgway’s rail that occupy wetlands in the Specific Plan area.

Green Industrial Land Use

The proposed land use alternative map in the Initial Study (Dudek 2023) indicates that Green Industrial development will occur adjacent to the Sonny Bono Salton Sea National Wildlife Refuge (SBSSNWR) and other rare and declining natural communities such as open water and marsh habitat along the Pacific Flyway (Donnelly *et al*. 2022). Per the Specific Plan’s Initial Study (Dudek 2023), Green Industrial is described as development including geothermal energy production plants, mineral recovery, biofuel generation, and green hydrogen. Ancillary uses may include, but not limited to, supportive manufacturing, commercial, logistics, and battery manufacturing and storage. These developments could result in adverse effects such as noise, dust pollution, and fatalities associated with collision, to the animals that occupy areas within the SBSSNWR and in open water, marsh, and upland natural communities. These adverse effects could lower reproductive rates in avian species that occupy these natural communities. Therefore, we recommend the Specific Plan PEIR include mitigation measures that include minimal setback, or buffer, distances when citing these industrial developments adjacent to the SBSSNWR and rare and declining natural communities (Donnelly *et al*. 2022). These setbacks should include a defined distance, usually expressed in feet or miles, from a resource feature (such as the edge of a natural community or occupied habitat) within which an activity would not occur. The purpose of the setback is to maintain the function and value of the existing biological resources in the Specific Plan Area.

Main Transportation Corridor

Based on Figure 2 in the Initial Study (Dudek 2023), several existing dirt roads in the Specific Plan area will be designated as a "Main Transportation Corridor." However, no information is included to describe these corridors. Based on the proposed location of these corridors, there could be adverse effects to endangered species, migratory birds, and SBSSNWR lands. For example, the extension of Davis Road to the west could bisect wetlands managed by the SBSSNWR for the benefit of Yuma Ridgway's rail and other waterfowl, and the Alamo River, which supports desert pupfish. We recommend that future transportation facilities be sited to avoid impacts to SBSSNWR lands, wildlife corridors, and avoid fragmentation of wildlife habitat. Where habitat impacts cannot be avoided, techniques such as wildlife over- and underpasses and noise abatement should be considered. The impacts of paving on stormwater quality and quantity should be minimized by providing facilities such as vegetated swales that filter pollution and help recharge groundwater. The incorporation of native vegetation can reduce air, light, and noise pollution; avoid soil erosion; and provide shade to mitigate the effects of the urban heat island and reduce potential for invasive species establishment. Lastly, the extension of Davis Road to the south depicted in Figure 2 of the Initial Study (Dudek 2023) would bisect cattail (*Typha* spp.) marsh, seasonal wetlands, and the Alamo River, therefore, we recommend the future alignment of Davis Road be reconfigured to avoid these sensitive wetlands resources.

Migratory Birds

The Specific Plan area is located adjacent to the Salton Sea within the Pacific Flyway. These areas provide permanent habitat and seasonal refuge to hundreds of species of resident and migratory birds and large populations of shorebirds, wading birds, waterfowl, raptors, upland gamebirds, neotropical migrants, and other passerines (Shuford *et al*. 2002; Patten *et al*. 2003). To date, limited published information exists on bird collisions at renewable energy facilities within the Salton Sea Basin due to a lack of systematic, statistically rigorous monitoring. However, utility-scale photovoltaic, parabolic trough, and power tower projects that are currently under construction or in operation in other parts of the California desert are reporting avian mortalities and injuries resulting from collisions and other accidents with various project features, including solar panels or heliostats, evaporation ponds, fencing, electrical distribution lines onsite, and generation tie (gen-tie) lines to regional substations on the electrical grid (Conkling *et al*. 2023).

Based on preliminary avian mortality reports from existing facilities, the Specific Plan area's proximity to the Salton Sea and Pacific Flyway, and the large number of permitted or proposed utility-scale solar and transmission projects in the area, there is the potential for cumulative effects on the abundance and distribution of the bird species occurring as resident, winter visitors, and/or migrants in and around the Salton Sea. The PEIR should include an accurate analysis of the impacts of cumulative habitat loss and the potential for bird fatalities at the proposed renewable energy facilities and associated infrastructure.

Also, the Specific Plan PEIR should include avoidance and minimization measures as policies, programs, or biological requirements as a part of the PEIR to further avoid or reduce adverse

effects to migratory birds. For example, participating in or establishing a joint venture collaborative that directly benefits the Salton Sea would help offset direct habitat loss to birds and potential population impacts to migratory birds. A joint venture is a collaborative, regional partnership of government agencies, non-profit organizations, corporations, tribes, and individuals that conserves habitat for priority bird species, other wildlife, and people. Additionally, we recommend all projects associated with the Specific Plan with adverse effects to avian species develop an Avian Protection Plan (APP) that would further the conservation of avian species. The APP should include, at a minimum, a nesting bird management plan and systematic post-construction mortality monitoring along newly installed distribution and gen-tie lines to ensure the measures to reduce collisions with these lines are adequate. The Service is available to work with the project applicant to develop an effective APP. See Appendix for specific information on developing an APP.

Marsh Areas

As indicated in the Initial Study (Dudek 2023), projects developed under the Specific Plan could potentially have a substantial adverse effect on state or federally protected wetlands, including marshes and other types of wetland habitats. Of the 8,115 acres of wetland communities and 4,097 acres of Salton Sea shoreline and playa that may support wetlands in the Specific Plan area (Rick Engineering 2023, Table 9.4-2), 7,788 acres are managed to support waterfowl and other avian species. These managed wetlands include the California Department of Fish and Wildlife's (CDFW) Imperial Wildlife Area Wister Unit, SBSSNWR, and Imperial Irrigation District's (IID) managed marsh complex. As mentioned above, the Specific Plan PEIR should incorporate mitigation measures that include minimal setback, or buffer, distances when citing industrial developments adjacent to the SBSSNWR and other wetland natural communities within the Specific Plan area. The purpose of the setback is to maintain the function and value of the existing biological resources within these wetland communities. If adverse effects to SBSSNWR lands cannot be completely avoided by using setbacks, the PEIR should include mitigation measures to ensure SBSSNWR managed wetlands have access to enough water to ensure the wetlands persist.

The IID-managed marsh complex was created to offset adverse impacts from the Quantification Settlement Agreement (QSA) and will be managed in perpetuity to support rare and listed species such as Yuma Ridgway's rail and California black rail (*Laterallus jamaicensis coturniculus*). Because the IID managed marsh is a mitigation area, we recommend the Specific Plan avoid siting infrastructure near the marsh to ensure it remains a viable mitigation area. The Land Use Alternative proposed in the Notice of Preparation indicates that Pound and English Roads will be improved to support Specific Plan goals. Improving these existing dirt roads would increase traffic and noise in the area, which could result in adverse impacts to avian species such as road mortality and increases in noise levels that could impair essential breeding activities. We recommend the Specific Plan Land Use Alternative identify road improvements in locations other than those adjacent to the IID managed marsh complex.

The Specific Plan area also supports unmanaged marsh areas. These areas occur in discrete patches of shallow wetlands downstream of the IID irrigation drains that do not extend out to the Salton Sea. These areas also support desert pupfish and Yuma Ridgway's rail reproduction, numbers,

and distribution. The number of acres occurring as unmanaged marsh areas in the Specific Plan is unknown, but is likely currently around 1,600 acres (Service 2023). Therefore, complete avoidance of dewatering drains, laterals, and unmanaged wetlands should be the first goal of citing projects associated with the Specific Plan to ensure adverse effects to wetlands are avoided. We recommend the PEIR include policies, programs, or biological requirements that ensure avoidance of these resources or mitigate for the loss of these resources per applicable California and Federal laws.

Burrowing Owl

The Western burrowing owl (*Athene cunicularia* ssp. *hypugaea*) has declined in recent decades across much of its range, including California, where it is classified as a Species of Special Concern (Wilkerson and Siegel 2010). In the Imperial Valley, burrowing owls are year-round residents, occurring at high densities relative to other areas in the state; about 70 percent of California's burrowing population occurs in the Imperial Valley (Wilkerson and Siegel 2010). In the Specific Plan area, burrowing owls inhabit agricultural areas and use burrows in the earthen banks of agricultural canals, laterals, and drains. (Rick Engineering 2023).

Projects proposed under the Specific Plan will likely result in disturbance of burrowing nests in canal, lateral, and drain habitat and loss of foraging habitat in agricultural fields. Therefore, we recommend the strategies identified in the CDFW Staff Report on Burrowing Owl Mitigation (CDFW 2012) be incorporated as mitigation measures in the PEIR to reduce these adverse effects on burrowing owls. These include conducting pre-project surveys, avoiding destruction of burrows, restricting activities to outside of the nesting season, marking burrows, and educating construction workers. A summary of these measures is included in Appendix. For a complete description of the measures refer the CDFW Staff Report on Burrowing Owl Mitigation (CDFW 2012).

Western Monarch Butterfly Conservation Strategies

The western migratory monarch butterfly (*Danaus plexippus*) population has declined by more than 99 percent since the 1980s, prompting the Service to join state agencies, tribes, other federal agencies, and non-government groups to identify threats to the western monarch butterfly and take steps to conserve the species throughout their range. Currently, the western monarch butterfly is a candidate for listing under the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq*.). As such, our current conservation strategy is to work with partners across the monarch's range to implement conservation recommendations (see Appendix). To this end, we recommend the Specific Plan PEIR include the measures identified in the Appendix for monarch butterflies, where reasonable and feasible. The main goal would be to increase early emerging milkweed species across early and summer breeding zones (see Figure 1 in Appendix). In Imperial County, this would entail planting appropriate milkweed species, such as desert or rush milkweed (*Asclepias subulate*) or whitestem milkweed (*A. albicans*).

Yuma Ridgway's Rail

The Yuma Ridgway's rail in the United States is currently restricted to wetlands along the Salton Sea and lower Colorado River (Service 2009, 2014). Yuma Ridgway's rail occurs within the Specific Plan area in the managed marsh areas and unmanaged wetlands (marshes) downstream of the irrigation drains that drain onto the Salton Sea playa (Service 2023). Therefore, avoiding dewatering of irrigation drains and wetlands should be the first goal of citing projects associated with the Specific Plan. To ensure these areas are avoided, Land Use Designations for these areas should be classified as Conservation. The Specific Plan PEIR should also include avoidance measures as policies, programs, or biological requirements as a part of the PEIR to avoid or minimize adverse effects. These measures should be developed for each project that will result in less drain water exiting from laterals and drains or dewatering of wetlands.

Based on recent research, Yuma Ridgway's rails in the Salton Sea basin occupy the Specific Plan area year-round and typically make successful short-distance dispersals (Harrity and Conway 2021; Ricca *et al*. 2022), but a long-distance migration has been documented (Harrity and Conway 2021). Radar studies conducted in the 1980s at the south end of the Salton Sea along the Alamo and New Rivers documented Yuma Ridgway's rails departing marsh habitats flying at relatively low altitudes of 50–100 meters (Robert McKernan 2018, pers. comm.). This dispersal behavior and low-elevation flight patterns make all age classes of Yuma Ridgway's rails susceptible to collisions with many structures, including power lines, towers, fences, and solar panels. We are aware of one Yuma Ridgway's rail fatality that occurred at a nearby solar project near Calipatria, California, resulting from a collision. Therefore, we recommend the Specific Plan PEIR incorporate measures to reduce this potential adverse effect. See Appendix for avoidance and minimization measures for Yuma Ridgway's rail to avoid potential fatalities associated with projects developed under the Specific Plan.

Desert Pupfish

Desert pupfish are known to occur within the Specific Plan area in the irrigation drains (below the last drop structure) and wetlands downstream of the irrigation drains that drain onto the Salton Sea playa. Desert pupfish also could be present in furrows; shallow water ponded in Salton Sea shoreline berms; and Salton Sea shallow shoreline areas near drainage outlets, depending on water quantity and salinity levels.

The populations in irrigation drains are identified as naturally occurring wild desert pupfish, or Tier 1, populations in the Desert Pupfish Recovery Plan (Service 1993) and conservation of these areas is essential to achieving desert pupfish recovery goals. Complete avoidance of dewatering drains, laterals, and wetlands should be the first goal of citing projects associated with the Specific Plan. If avoidance is not feasible, the Specific Plan should include avoidance and minimization measures as policies, programs, or biological requirements as a part of the PEIR. We recommend the Specific Plan PEIR include measures to avoid and minimize adverse effects such as pre-project surveys and a desert pupfish protection and relocation plan. More information on desert pupfish avoidance and minimization is included in Appendix. These measures should

be developed for each project that will result in less drain water exiting from laterals and drains or dewatering of wetlands.

We appreciate the opportunity to provide technical assistance comments on the Specific Plan. If you have any questions regarding this document, please contact Felicia Sirchia[1] of the Palm Springs Fish and Wildlife Office at 760-322-2070, extension 405, or Jonathan Shore[2] or Razia Shafique[3] of the SBSSNWR at 760-354-9378.

Sincerely,

for Rollie White
Assistant Field Supervisor

Appendix

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APPENDIX

U.S. Fish and Wildlife Service
Avoidance and Minimization Recommendations on the
Draft Program Environmental Impact Report for the Lithium Valley Specific Plan

AVIAN RECOMMENDATIONS

1. Prepare and implement an Avian Protection Plan (APP) in consultation with Imperial County, the CDFW, and the Service for review and comment. The APP will include the following:

    a. A description and assessment of the existing habitat, risk characterization, and avian risk minimization measures.

    b. A statistically robust, systematic avian and bat mortality and injury monitoring program to achieve the following: (1) estimate annual mortality by taxa and season using appropriate methods; (2) identify the extent of collision and other mortality during diurnal and nocturnal times of the day; (3) assess the spatial distribution and abundance of mortalities on the project site; and (4) provide resources to collect biological/morphometric data to help determine which regional populations of species with management priority are affected by the project. This monitoring should be of sufficient durations to account for year-to-year variation in mortality rates.

    c. An adaptive management and decision-making framework for reviewing, characterizing, and responding to monitoring results.

    d. Specific conservation measures and/or programs to minimize and reduce avian injury or mortality over time and evaluation of the applicability and effectiveness of those measures using results from the monitoring program.

    e. Water storage and brine pond management.

2. Avoid using lattice-type structures and placing external ladders and platforms on towers to minimize perching and nesting.

3. Minimize use of outdoor lighting. If lighting is necessary, it should be focused downward to reduce skyward illumination. Lights should be equipped with motion detectors to reduce continuous illumination.

4. Where feasible, install transmission and distribution lines underground or on the surface as insulated, shielded wire to avoid avian collision and electrocution hazards. Use the most recent recommendations of the Avian Power Line Interaction Committee (APLIC 2006, 2012) for any required above-ground lines, transformers, or conductors to reduce collisions and electrocutions. When transmission lines must be above-ground, avoid placing lines within wetlands and over canyons.

5. Install and replace flight diverters, as needed on the proposed transmission line to render the line more visible to resident listed and migratory birds, including night-migrating birds.

6. Install fence markers or other devices on perimeter fences to render the fence more visible (both day and night) to resident listed and migratory birds to reduce collision risk.

BURROWING OWL RECOMMENDATIONS (CDFW 2012)

The current scientific literature indicates that any site-specific avoidance or mitigation measures developed should incorporate the best practices presented below or other practices confirmed by experts and CDFW. The CDFW and the Service are available to assist in the development of site-specific avoidance and mitigation measures.

Avoiding

A primary goal is to design and implement projects to seasonally and spatially avoid negative impacts and disturbances that could result in take of burrowing owls, nests, or eggs. Other avoidance measures may include but not be limited to:

1. Avoid disturbing occupied burrows during the nesting period, from February 1st through August 31st.

2. Avoid impacting burrows occupied during the non-breeding season by migratory or non-migratory resident burrowing owls.

3. Avoid direct destruction of burrows through chaining (dragging a heavy chain over an area to remove shrubs), disking, cultivation, and urban, industrial, or agricultural development.

4. Develop and implement a worker awareness program to increase the on-site worker's recognition of and commitment to burrowing owl protection.

5. Place visible markers near burrows to ensure that farm equipment and other machinery does not collapse burrows.

6. Do not fumigate, use treated bait or other means of poisoning nuisance animals in areas where burrowing owls are known or suspected to occur (e.g., sites observed with nesting owls, designated use areas).

7. Restrict the use of treated grain to poison mammals to the months of January and February.

Take Avoidance (Pre-construction) Surveys

Take avoidance surveys are intended to detect the presence of burrowing owls on a project site at a fixed period in time and inform necessary take avoidance actions. Take avoidance surveys may detect changes in owl presence such as colonizing owls that have recently moved onto the site, migrating owls, resident burrowing owls changing burrow use, or young of the year that are still present and have not dispersed.

Site Surveillance

Burrowing owls may attempt to colonize or re-colonize an area that will be impacted; thus, the current scientific literature indicates a need for ongoing surveillance at the project site during

project activities is recommended. The surveillance frequency/effort should be sufficient to detect burrowing owls if they return. Subsequent to their new occupancy or return to the site, take avoidance measures should assure with a high degree of certainty that take of owls will not occur.

Minimizing

If burrowing owls and their habitat can be protected in place on or adjacent to a project site, the use of buffer zones, visual screens, or other measures while project activities are occurring can minimize disturbance impacts. Conduct site-specific monitoring to inform development of buffers. The following general guidelines for implementing buffers should be adjusted to address site-specific conditions using the impact assessment approach described above. The California Environmental Quality Act (CEQA) lead agency and/or project proponent is encouraged to consult with the CDFW and other burrowing owl experts for assistance in developing site-specific buffer zones and visual screens.

Buffers

Holroyd *et al*. (2001) identified a need to standardize management and disturbance mitigation guidelines. For instance, guidelines for mitigating impacts by petroleum industries on burrowing owls and other prairie species (Scobie and Faminow 2000) may be used as a template for future mitigation guidelines (Holroyd *et al*. 2001). Scobie and Faminow (2000) developed guidelines for activities around occupied burrowing owl nests that recommended buffers.

Burrow Exclusion and Closure

Burrow exclusion is a technique of installing one-way doors in burrow openings during the non-breeding season to temporarily exclude burrowing owls, or permanently exclude burrowing owls and close burrows after verifying burrows are empty by site monitoring and scoping. Exclusion in and of itself is not a take avoidance, minimization, or mitigation method. Eviction of burrowing owls is a potentially significant impact under CEQA.

Translocation

Currently, there is little published information regarding the efficacy of translocating[4] burrowing owls, and additional research is needed to determine subsequent survival and breeding success (Holroyd *et al*. 2001; Klute *et al*. 2003). Study results for translocation in Florida implied that hatching success may be decreased for populations of burrowing owls that undergo translocation (Nixon 2006). At this time, the Department is unable to authorize the capture and relocation of burrowing owls except within the context of scientific research (FGC §1002) or a Natural Community Conservation Planning strategy.

Mitigating Impacts

Habitat loss and degradation from rapid urbanization of farmland in the core areas of the Central and Imperial valleys is the greatest of many threats to burrowing owls in California (Shuford and Gardali 2008). At a minimum, if burrowing owls have been documented to occupy burrows at the project site in recent years, the current scientific literature supports the conclusion that the

[4] Active relocation offsite >100 meters.

site should be considered occupied, and mitigation should be required by the CEQA lead agency to address project-specific significant and cumulative impacts. Other site-specific and regionally significant and cumulative impacts may warrant mitigation. The CDFW is available to assist in the identification of suitable mitigation lands.

Creating Artificial Burrows

Artificial burrows have been used to replace natural burrows either temporarily or long-term and their long-term success is unclear. Artificial burrows may be an effective addition to in-perpetuity habitat mitigation if they are augmenting natural burrows, the burrows are regularly maintained (i.e., no less than annually, with biennial maintenance recommended), and surrounding habitat patches are carefully maintained. There may be some circumstances, for example at airports, where squirrels will not be allowed to persist and create a dynamic burrow system, where artificial burrows may provide some support to an owl population.

WESTERN MONARCH BUTTERFLY CONSERVATION RECOMMENDATIONS

U.S. Fish and Wildlife Service

October 15, 2021

Purpose

Section 7(a)(1) of the Act directs federal agencies to use their authorities to further the purpose of the Act, by conducting conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary activities that an action agency may undertake to avoid and minimize the adverse effects of a proposed action, implement recovery plans, or to develop information that is useful for the conservation of listed species. The purpose of the following conservation recommendations is to encourage federal agencies to incorporate monarch butterflies into their Environmental Assessments and Biological Assessments associated with Section 7 Biological Opinions, when in consultation with the Service. These recommendations are organized by habitat zone, so that they may be cut/pasted, as applicable and contingent upon project location. There is potential utility for these recommendations beyond Section 7, and they are intended to promote benefits for other pollinators as well.

Background

The western migratory monarch butterfly population has declined by more than 99 percent since the 1980s. An estimated 4.5 million monarchs overwintered on the California coast in the 1980s, whereas in 2020, the population estimate for overwintering monarchs was less than 2,000 butterflies. This extreme population decline is likely due to multiple stressors across the monarch's range, including the loss and degradation of overwintering groves; pesticide use, particularly insecticides; loss of breeding and migratory habitat; climate change; parasites; and disease. Historically, the majority of western monarchs spent the winter in forested groves near the coast from Mendocino County, California, south into northern Baja California, Mexico. In recent years, monarchs have not clustered in the southern-most or northern-most parts of their overwintering range, and there are year-round residents in some areas of the coast. This resident phenomenon is likely due to a combination of climate change and an abundance of residential-planted non-native, tropical milkweed that is available for monarchs year-round. Migratory western monarchs depart the overwintering groves in mid-winter to early-spring. Throughout the

spring and summer, monarchs breed, lay their eggs on milkweed, and migrate across multiple generations within California and other states west of the Rocky Mountains. In an attempt to reverse the severe population decline of western monarch butterflies, and to protect other pollinators as well, we encourage implementation of the conservation recommendations listed below. Please see Figure 1 for suggested areas to focus voluntary conservation actions in California. Western monarch conservation actions outside of California are also important, especially for the larger pollinator community. Recommendations for other western states are addressed in the "All Breeding and Migratory Zones" section of this document.

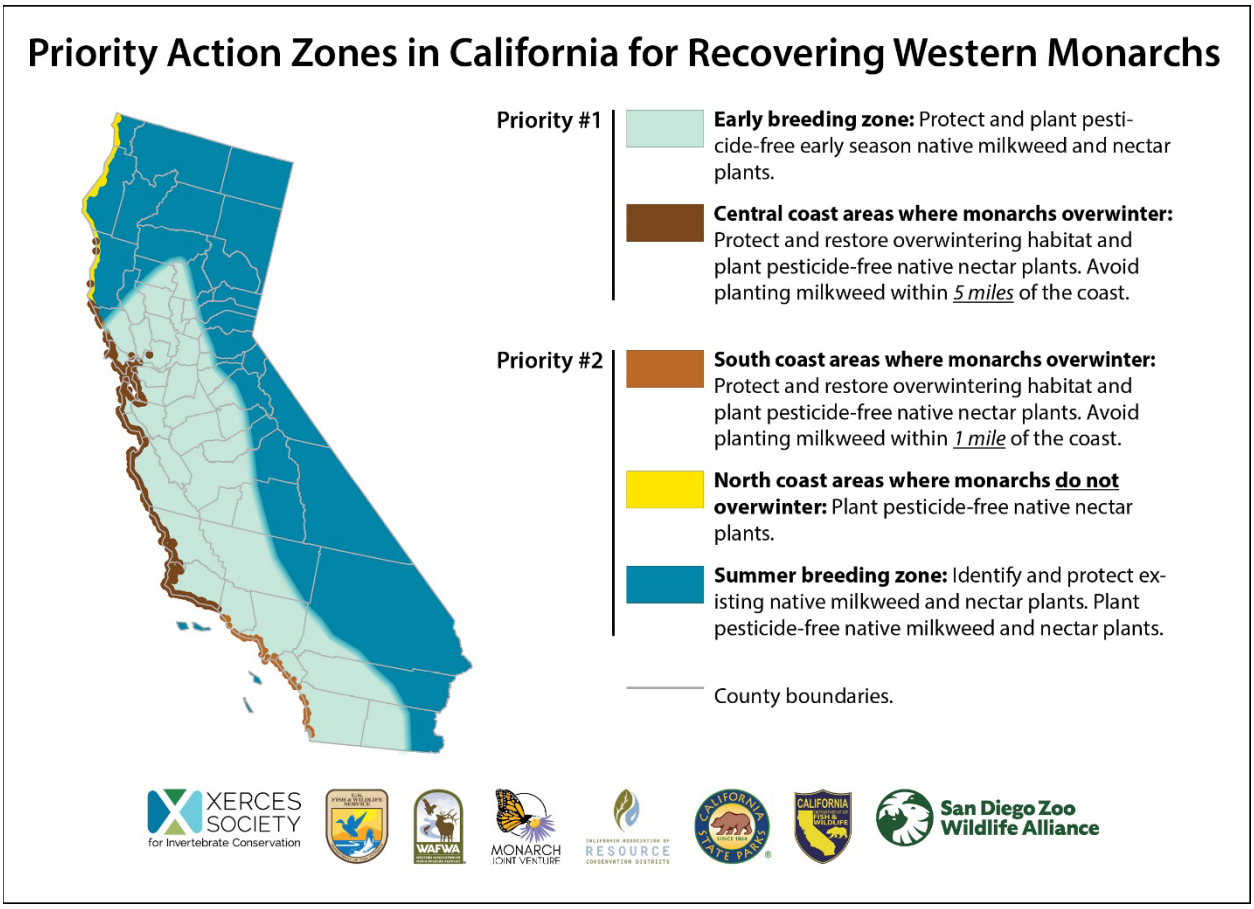

Figure 1. Priority Monarch Habitat Restoration Areas in California.

Coastal California Overwintering Habitat

Western monarchs migrate to the California coast, and cluster in a specific set of forested tree groves during the fall and winter each year. Overwintering groves provide protection from inclement weather and possess suitable vegetation and microclimate conditions for monarchs (e.g., roosting trees, wind protection, dappled sunlight, nectar sources, water and/or dew for hydration, high humidity, and an absence of freezing temperatures). In the overwintering zone of the coast (i.e., within 5 miles of the coast from Mendocino County south through Santa Barbara County, and within 1 mile of the coast from Ventura County south through San Diego County), we recommend the following:

1. Protect, manage, enhance and restore monarch butterfly overwintering groves (Find An Overwintering Site[5]).

2. Use only native, insecticide-free plants for habitat restoration and enhancement actions.

3. Conduct overwintering grove habitat assessment(s), and develop and implement long-term grove management plans, as applicable. Management plan actions for groves may include, but are not limited to:

    a. Enhance roosting trees within overwintering groves and within 1/2 mile of groves by planting trees [e.g., Monterey pine (*Pinus radiata*), Monterey cypress (*Cupressus macrocarpa*), Coast redwood (*Sequoia sempervirens*), coast live oak (*Quercus agrifolia*), Douglas fir (*Pseudotsuga menzesii*), Torrey pine (*Pinus torreyana*), western sycamore (*Platanus racemosa*), bishop pine (*Pinus muricata*) and others, as appropriate for location).

    b. Avoid the removal of trees or shrubs within 1/2 mile of overwintering groves, except for specific grove management purposes, and/or for human health and safety concerns. The maintenance of trees and shrubs within a 1/2 mile of these sites provides a buffer to preserve the microclimate conditions of the winter habitat.

    c. Conduct management activities (e.g., tree trimming, mowing, burning, and grazing) in monarch overwintering groves from March 16–September 14 (outside of the estimated timeframe when monarchs are likely present), in coordination with a monarch biologist.

    d. Enhance nectar sources by planting fall/winter blooming forbs or shrubs within overwintering groves and within 1 mile of the groves (Nectar Planting Lists[6]).

4. Protect monarchs, other pollinators, and their habitats from pesticides (i.e., insecticides and herbicides). Specific recommendations may vary by site.

    a. Avoid the use pesticides within 1 mile of overwintering groves, particularly when monarchs may be present. If pesticides are used, then conduct applications from March 16–September 14, when possible.

    b. Screen all classes of pesticides for pollinator risk to avoid harmful applications, including biological pesticides such as *Bacillus thuringiensis* (UC Integrated Pest Management[7]).

    c. Avoid the use of neonicotinoids or other systemic insecticides, including coated seeds, any time of the year in monarch habitat due to their ecosystem persistence, systemic nature, and toxicity.

[5] https://westernmonarchcount.org/map-of-overwintering-sites/.
[6] https://xerces.org/sites/default/files/publications/18-003_02_Monarch-Nectar-Plant-Lists-FS_web%20-%20Jessa%20Kay%20Cruz.pdf.
[7] https://ipm.ucanr.edu/bee-precaution-pesticide-ratings/.

d. Consider non-chemical weed control techniques, when possible (Cal-IPC Non-chemical BMPs[8]).

e. Avoid herbicide application on blooming flowers. Apply herbicides during young plant phases, when plants are more responsive to treatment, and when monarchs and other pollinators are less likely to be nectaring on the plants.

f. Whenever possible, use targeted application herbicide methods, avoid large-scale broadcast applications, and take precautions to limit off-site movement of herbicides (e.g., drift from wind and discharge from surface water flows).

g. Separate habitat areas from areas receiving chemical treatments with a pesticide-free spatial buffer and/or evergreen vegetative buffer of coniferous, non-flowering trees to capture chemical drift. The appropriate monarch and pollinator habitat spatial buffer size depends on several factors, including weather and wind conditions, but at a minimum, the habitat should be at least 40 feet from ground-based pesticide applications, 60 feet from air-blast sprayers, and 125 feet from any systemic insecticide applications or seed-treated plants.

5. To minimize the spread of the pathogen *Ophryocystis elektroscirrha* (OE), and to encourage natural monarch migration, do not plant non-native tropical milkweed (*Asclepias curassavica*). OE is able to build up on tropical milkweed, because these plants are evergreen, and they do not die back in the winter. OE can be debilitating and/or lethal to monarchs.

6. Remove any tropical milkweed that is detected, and replace it with nectar plants suitable for the location (Nectar Planting Lists).

7. To assist in maintaining normal migration behavior, do not plant any type of milkweed within 5 miles of the coast from Mendocino County south through Santa Barbara County, and within 1 mile of the coast south of Santa Barbara County.

8. After appropriate training, conduct grove monitoring for butterflies during the Western Monarch Counts each fall and winter. When possible, report when monarchs arrive and depart the groves each year (Western Monarch Count[9]).

9. To provide benefits for monarchs and other pollinators anywhere on the landscape within the overwintering zone, install a mosaic of nectar plants that bloom throughout the year, as is feasible (Nectar Planting Lists).

Breeding and Migratory Habitat

Monarch butterflies breed and migrate across multiple generations each year throughout the western U.S. The early breeding zone (i.e., Priority 1) is an estimated area in California where monarchs are likely to breed and/or lay their eggs on milkweed after departing the overwintering groves in mid-winter to early spring each year (See Figure 1, above). Early emerging milkweed species are likely a limiting factor on the landscape in the early breeding zone and may be

[8] https://www.cal-ipc.org/resources/library/publications/non-chem/.
[9] https://westernmonarchcount.org/.

associated with the severe population decline of western monarchs, and these plants are essential to successfully create the next generation of migratory butterflies. For monarch breeding and migratory habitat, we recommend the following:

Priority 1 Zone

1. Enhance and maintain habitat in the Priority 1 early breeding zone of California, (Figure 1, above), by identifying and protecting existing habitat, and planting native, insecticide-free early-emerging milkweed species (e.g., *Asclepias vestita*, *A. californica*, *A. eriocarpa*, *A. cordifolia*, *A. erosa*), and flowering plants that are available to monarchs from January–April, as appropriate for the project location (Nectar Planting Lists; Milkweed Seed Finder).

For All Breeding and Migratory Zones

2. Use only native, insecticide-free plants for habitat restoration and enhancement actions.

3. Enhance and maintain habitat in the Priority 2 zone of California (Figure 1, above) and in other western states, by identifying and protecting existing habitat, and planting milkweed species and flowering plants that are appropriate for the location (Nectar Planting Lists; Milkweed Seed Finder[10]).

4. Conduct management activities such as mowing, burning, and grazing in monarch breeding and migratory habitat outside of the estimated timeframe when monarchs are likely present (Figure 2, below).

5. Protect monarchs, other pollinators, and their habitats from pesticides (i.e., insecticides and herbicides).

    a. Avoid the use of pesticides when monarchs may be present, when feasible (Figure 2, below).

    b. Screen all classes of pesticides for pollinator risk to avoid harmful applications, including biological pesticides such as *Bacillus thuringiensis* (UC Integrated Pest Management).

    c. Avoid the use of neonicotinoids or other systemic insecticides, including coated seeds, any time of the year in monarch habitat due to their ecosystem persistence, systemic nature, and toxicity.

    d. Consider non-chemical weed control techniques, when feasible (Cal-IPC Non-chemical BMPs).

    e. Avoid herbicide application on blooming flowers. Apply herbicides during young plant phases, when plants are more responsive to treatment, and when monarchs and other pollinators are less likely to be nectaring on the plants.

[10] https://www.xerces.org/milkweed/milkweed-seed-finder.

f. Whenever possible, use targeted application herbicide methods, avoid large-scale broadcast applications, and take precautions to limit off-site movement of herbicides (e.g., drift from wind and discharge from surface water flows).

g. Separate habitat areas from areas receiving treatment with a pesticide-free spatial buffer and/or evergreen vegetative buffer of coniferous, non-flowering trees to capture chemical drift. The appropriate monarch and pollinator habitat spatial buffer size depends on several factors, including weather and wind conditions, but at a minimum, the habitat should be at least 40 feet from ground-based pesticide applications, 60 feet from air-blast sprayers, and 125 feet from any systemic insecticide applications or seed-treated plants.

6. To minimize the spread of the pathogen *Ophryocystis elektroscirrha* (OE), do not plant non-native tropical milkweed (*Asclepias curassavica*). OE can build up on tropical milkweed and infect monarchs, because these plants are evergreen and do not die back in the winter. OE can be lethal to monarchs.

7. Remove tropical milkweed that is detected, and replace it with milkweed and nectar plants appropriate for the location (Nectar Planting Lists; Milkweed Seed Finder).

8. Report milkweed and monarch observations from all life stages, including breeding butterflies, to the Monarch Milkweed Mapper[11] or via the project portal[12] in the iNaturalist smartphone app.

[11] https://www.monarchmilkweedmapper.org/.
[12] https://www.inaturalist.org/projects/western-monarch-milkweed-mapper.

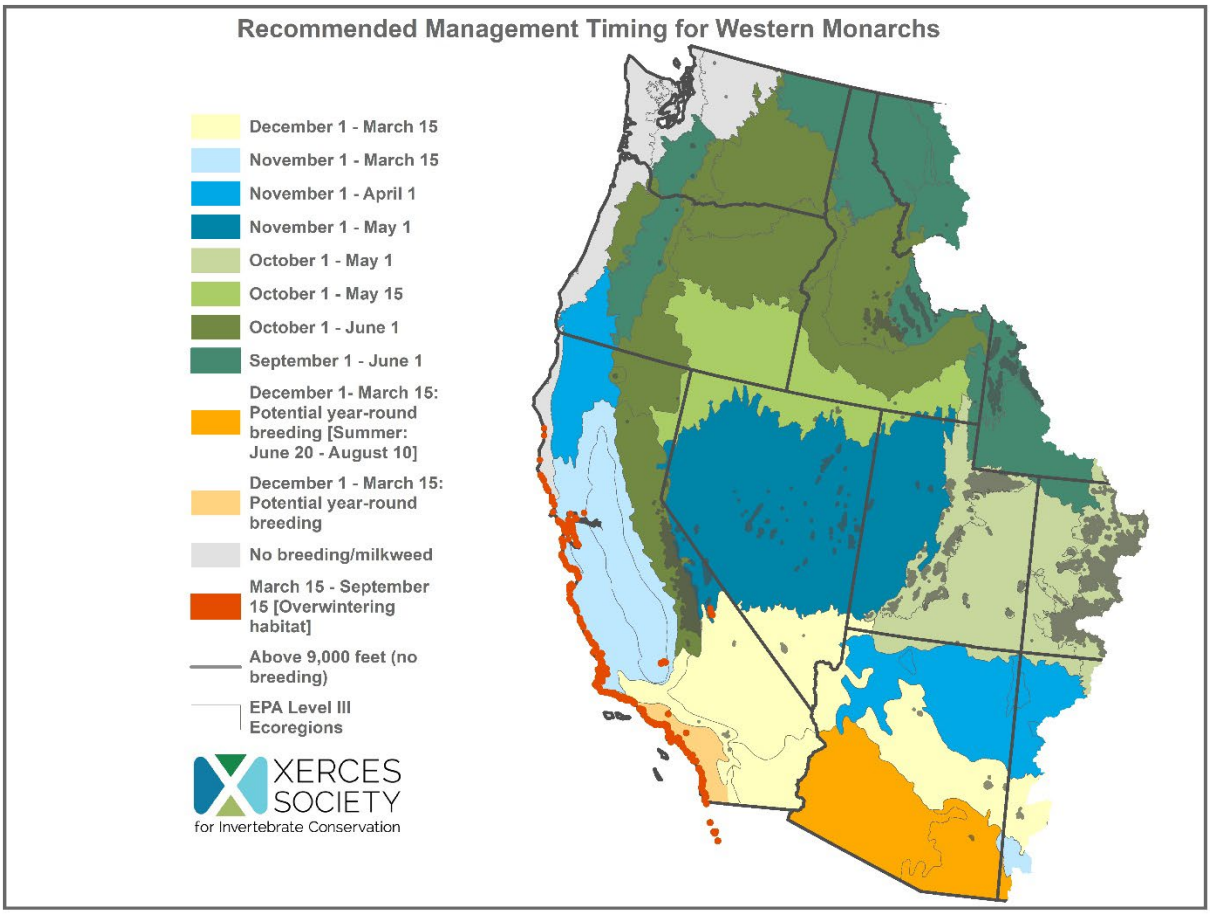

Figure 2. Recommended Management (i.e., mowing, burning, grazing, pesticide applications) Timing Windows in the western U.S. by Zone.
Notes: The management timing windows illustrated in Figure 2 represent approximate recommendations of timeframes to conduct management actions. These timeframes are based upon the best available current information and may be updated in the future. Each year and site is different, so when possible, please consider surveying milkweed plants for the early life stages of monarchs prior to burning, mowing, grazing or applying pesticides.

YUMA RIDGWAY'S RAIL AVOIDANCE AND MINIMIZATION MEASURES

Prepare and Implement a Project-Level Yuma Ridgway's Rail Management and Survey Plan

This plan will be submitted to the CDFW and the Service for review and approval prior to any ground disturbing activities. All activities will be conducted in accordance with CDFW and Service permits and regulatory guidance. At a minimum, this plan will include:

1. A description of requirements for preconstruction (or pre-maintenance) focused surveys for Yuma Ridgway's rail to be conducted where project-level features are within or immediately adjacent to marsh habitat. Surveys will be conducted using current Service protocols and/or methods approved by the CDFW in coordination with the Service.

2. A list of avoidance and minimization measures for breeding season and non-breeding season.

a. Breeding Season: If Yuma Ridgway's rails are detected within 500 feet of planned construction or maintenance activity locations, work within that 500-foot buffer will be rescheduled for after the breeding season. All habitat occupied will be avoided from February 16 to September 30 to ensure birds can fledge and find adjacent habitat.

b. Non-breeding Season: Work being conducted outside the breeding season within that 500-foot buffer will have an approved biological monitor present to avoid adverse effects to this species. Additional avoidance and minimization measures may be developed and implemented if the biological monitor observes that effects are still occurring to non-breeding individuals.

3. A seasonal restriction to ensure any project specific activity with potential to alter water levels in adjacent marsh habitats will not occur between February 16 and September 30 to ensure birds of all life stages can successfully relocate to nearby marsh habitat.

4. Annual reporting requirements, to be combined with annual reporting for other biological elements of the project.

DESERT PUPFISH AVOIDANCE AND MINIMIZATION MEASURES

Prepare and Implement a Desert Pupfish Protection and Relocation Plan

This plan will be submitted to the CDFW and the Service for review and approval prior to any ground-disturbing activities that have a water component. This plan will meet state and federal requirements and will include:

1. Protocols for pre-construction or pre-maintenance surveys to assess species presence and spawning within or immediately adjacent to work areas (e.g., in, or at the end of, the irrigation drains/drain canals, along the shoreline, and around the wetland margins). The protocols will also outline the qualifications required for biologists to conduct desert pupfish survey, capture, and relocation activities and the process for biologist approval.

2. Capture (e.g., trapping in the irrigation drains for construction and maintenance; or trapping, dip netting, and seining in ponds that are drained or if the water level is dropped) and transport methods to minimize handling and stress as well as exposure to heat, low dissolved oxygen (DO), and crowding.

3. Identification of locations for release of captured desert pupfish.

4. Timing windows when project construction or maintenance occurs in shallow shoreline areas and in the irrigation drain mouths/canals may be conducted with minimal effects on desert pupfish spawning.

5. Adaptive management procedures that include assessment of mitigation measure effectiveness, development of revised measures to improve effectiveness, and similar assessment of revised measures to verify effectiveness.

Keegan Kingsbury

From: Lois Bacon <loisbacon@sbcglobal.net>
Sent: Wednesday, February 14, 2024 12:59 AM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

This analysis should carefully consider cumulative impacts on the entire Imperial County Air Pollution Control District, which is already severely degraded. Any worsening air quality would significantly impact public health and likely exceed legal thresholds, which must be analyzed and mitigated. Given these concerns, please consider a project alternative requiring no reduced inflow to the Salton Sea.

Thank you.

Sincerely,
Lois Bacon
950 Tuttle Ave
Watsonville, CA 95076

February 19, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Drainage/Absorption, Geology/Soils, Hydrology/Water Quality, Recreation, Wetland/Riparian
Resident Name: Luke Botting
Resident City/Town: Bombay Beach

Scoping Comments:
Hello, I am a long time lover of the Salton sea, and property owner in Bombay Beach. I have immense concern as to how much water will be used per year that is extracted from the water table/brine and expelled as steam into the air, and the effects on the water table level and in turn, the Salton Sea and surrounding areas. Have any studies on subsidence been conducted? Will this impact the rate of subsidence in the Salton basin or potentially cause more earthquakes?

Keegan Kingsbury

From: Marc Silverman <dhalgrn@pacbell.net>
Sent: Monday, February 12, 2024 7:03 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

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Thank you.

Sincerely,
Marc Silverman
6030 graciosa drive
LA, CA 90068

Keegan Kingsbury

From: Margaret Shekell <mshekell@sbcglobal.net>
Sent: Monday, February 12, 2024 10:00 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

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Thank you.

Sincerely,
Margaret Shekell
11010 Rose Ave
Los Angeles, CA 90034

Keegan Kingsbury

From: Marguerite Shuster <shuster@fuller.edu>
Sent: Monday, February 12, 2024 1:06 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

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Thank you.

Sincerely,
Marguerite Shuster
675 MT. WILSON TRAIL
SIERRA MADRE, CA 91024

Keegan Kingsbury

From: Mari Matsumoto <ota-matsumoto@sbcglobal.net>
Sent: Monday, February 12, 2024 1:27 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

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Thank you.

Sincerely,
Mari Matsumoto
1720 Broadway
Alameda, CA 94501

February 20, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Air quality,
Resident Name: Maria Ramirez
Resident City/Town: Niland

Scoping Comments:

Yo entiendo que el litio nos ba a perjudicar porque se necesita mucha agua pues yo lei un reportaje que en los lugares que sacan litio le perjudica a toda la comunidad y pues el pueblo se queda sin agua y en la sequías afectan a la comunidad en la salud y todo. No constante con toda la contaminación que tenemos con las plantas térmicas y las planta de gas, todos los insecticidas que les ponen a las siembras, se dice que el Valle Imperial es el más contaminado de esta zona y ahora nos quieren poner el litio y pues va seguir la contaminación, más grave se va a poner el pueblo. No contaste con eso las plantas que viene a poner sus negocios aquí no ayudan a NIland en nada, y si ayudan queremos saber en dónde están las ayudas porque el pueblo siempre ha estado igual lo único que se sabe que mueren muchas personas de cáncer y asthma y demás enfermedades.

English Translation: "I understand that lithium is going to harm us because it requires a lot of water. I read an article that said in places where lithium is extracted, it harms the entire community, leaving the town without water, and droughts affect the community's health and everything. Not to mention all the pollution we have from the power plants and gas plants, all the insecticides they put on the crops. It is said that the Imperial Valley is the most polluted in this area, and now they want to put lithium here, so the pollution will continue, and the town will become even more serious. Not to mention that the plants coming to set up their businesses here do not help Niland at all, and if they do help, we want to know where the help is because the town has always been the same, the only thing we know is that many people die from cancer, asthma, and other diseases."

Keegan Kingsbury

From: Mark Cappetta <Mark@gsambc.com>
Sent: Monday, February 12, 2024 1:08 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

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Thank you.

Sincerely,
Mark Cappetta
13 Via Del Paradiso
Rancho Mirage, CA 92270

February 19, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Aesthetics, Agriculture and Forestry, Air Quality, Biological Resources, Cultural resources, Cumulative Effects, Drainage/Absorption, Geology/Soils, Hazards and Hazardous Materials, Hydrology/Water Quality, Land Use/Planning, Mineral Resources, Noise, Population/Housing, Public Services, Recreation, Schools/Universities, Septic System, Sewer Capacity/Solid Waste, Transportation, Vegetation, Wetland/Riparian, Wildfire
Resident Name: Mark Mack
Resident City/Town: Bombay Beach

Scoping Comments:
I am a stakeholder in Bombay Beach and I am concerned about the dwindling and diminishing Salton Sea, the neglected infrastructure around the sea and in Bombay Beach, the lack of Public Resources in our city- the lack of comfort stations - such as shade areas or a public swimming pool for the summertime heat; the lack of water in the Salton Sea will cause more more irreparable damage to the whole are and to Bombay Beach specifically

Any proposal that does not have measures built in that addresses the replenishment of water to the Salton Sea should be dismissed, any proposal that generates money out of the earth around the Salton sea shall be assessed a tax or directly invested in the area for climate restauration the generation of adequate housing, clean air restoration and community projects benefiting the neglected communities

Keegan Kingsbury

From: Martha Herrero <mail@marthaherrero.com>
Sent: Monday, February 12, 2024 2:16 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

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Thank you.

Sincerely,
Martha Herrero
153 The Masters Circle, CA
Costa Mesa, CA 92627

Keegan Kingsbury

From: Matt Wait <mattw@knock.la>
Sent: Monday, February 12, 2024 5:41 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

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Thank you.

Sincerely,
Matt Wait
2030 Rome Dr
Los Angeles, CA 90065

Keegan Kingsbury

From: Megan Cochran <hi@megancochran.com>
Sent: Tuesday, February 13, 2024 7:25 AM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

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Thank you.

Sincerely,
Megan Cochran
225 S Ditmar Street
Oceanside, CA 92054

February 20, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Air Quality, Cumulative Effects, Hazards and Hazardous Materials, Land Use/Planning
Resident Name: Meredith Winner
Resident City/Town: Bombay Beach

Scoping Comments:

Hi,

I'm Meredith and I am a resident of Bombay Beach. I am writing to express my concerns in regards to the lithium extraction planned in the area and its environment and economic impact. I'm curious to understand how the mining process might affect me and Bombay Beach residents. Will the water in the sea continue to recede? Are there reparation contingencies for any damage done to the town? What are the health effects if the water will not be replenished?

Bombay Beach is often forgotten when it comes to planning. The onus is not on our community to direct what types of planning should be conducted prior to this massive undertaking. It is your responsibility to do due diligence to see how our community will be impacted.

February 19, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Agriculture and Forestry, Air Quality / Calidad de aire, Biological Resources, Hazards and Hazardous Materials, Hydrology/Water Quality
Resident Name: Michael Bardin

Scoping Comments:
Lithium mining somewhere where it blows into where all our crops are grown is a poor choice.

This is dumb.

Keegan Kingsbury

From: michael passoff <michael@proxyimpact.com>
Sent: Monday, February 12, 2024 10:45 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

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Thank you.

Sincerely,
michael passoff
5011 Esmond Ave
Richmond, CA 94805

Keegan Kingsbury

From: Michael Sarabia <shakydog808@sbcglobal.net>
Sent: Monday, February 12, 2024 8:39 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

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Thank you.

Sincerely,
Michael Sarabia
407 W Longview Ave
Stockton, CA 95207

Keegan Kingsbury

From: Nancy Pichiotino <nancyp47@sbcglobal.net>
Sent: Monday, February 12, 2024 6:17 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

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Thank you.

Sincerely,
Nancy Pichiotino
102 Via San Carlos
Paso Robles, CA 93446

February 20, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Air Quality, other
Resident Name: Olga Garcia
Resident City/Town: Niland

Scoping Comments:
Les Pedimos su apoyo para mejorar a Niland pues nada más vienen y ponen sus empresas y Niland sigues igual. Y ahora con el litio va haber más enfermedades y nos van acabar el agua, y eso no nos lo dicen y ellos saben el impacto.
Que va a tener Niland, y hay personas que nos representa pero no hacen por NIland, solamente por Calipatria y Niland sigue olvidado. Les pido por favor que nos ayuden.

English Translation: "We ask for your support to improve Niland because they just come and put their companies and Niland remains the same. And now with lithium there will be more diseases and we will run out of water, and they don't tell us that and they know the impact. There are people who represent us but they don't do anything for Niland, only for Calipatria and Niland is still forgotten. I ask you to please help us."

Keegan Kingsbury

From: Penelope Prochazka <propen@sbcglobal.net>
Sent: Monday, February 12, 2024 2:32 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

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Thank you.

Sincerely,
Penelope Prochazka
3432 Corpus Christi St
Simi Valley, CA 93063

Keegan Kingsbury

From: Querido Galdo <querido@queridomundo.com>
Sent: Monday, February 12, 2024 1:15 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

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Thank you.

Sincerely,
Querido Galdo
PO Box 1415
Gualala, CA 95445

February 19, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Agriculture and Forestry, Air Quality, Biological Resources, Cultural resources, Cumulative Effects, Geology/Soils, Hazards and Hazardous Materials, Hydrology/Water Quality, Land Use/Planning, Noise, Population/Housing, Vegetation, Wetland/Riparian, Other
Resident Name: Rachel Uwa
Resident City/Town: Bombay Beach

Scoping Comments:
I am an educator currently visiting Bombay Beach for several months, planning to come back yearly, possibly moving to this location depending on safety hazards of the area as this Specific Plan develops. I am concerned about the already poor air quality of this area decreasing as extraction begins, as well as how it will affect soil and crops which may be grown or found naturally, how it will affect the water quality, how it might impact the geology and possibly lead to earthquakes, and all other impacts which may affect the quality of life of inhabitants today and for future generations. Will the increasing effects of climate change also be taken into account? I'm also concerned with noise polution as currently almost anything loud that happens in this city can be heard all-around from miles away. Will there be changes to city infrastructure that could account for better acoustics/absorption of sound if massive new building or machinery et al. are brought into the area for the extraction process? How much will this extraction process interrupt or affect the daily lives of citizens of this county? Additionally and primarily I am very concerned about the governance of this area and would like to know how local officials plan to ensure that all decisions will be made for the benefit of the people who live here more so than the potential profit that might come in. People deserve to matter more than profits. What will you all do to ensure this holds true above all?

In an ideal scenario a very thorough investigation will run before any definitive development plans are finalized and enacted. The local population should have the

opportunity for regular check-ins, updates, and the possibility to interrupt the flow of operations with important concerns as they arise. Additionally, there should be a clear process in place for whom to contact for support and compensation if and when things go awry.

Keegan Kingsbury

From: Raquel Narvios <ssalino@sbcglobal.net>
Sent: Tuesday, February 13, 2024 4:34 AM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

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Thank you.

Sincerely,
Raquel Narvios
1425 Visitacion Ave, San Francisco, CA, USA
San Francisco, CA 94134

February 19, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: All
Resident Name: Regina Victor
Resident City/Town: Bombay Beach

Scoping Comments:

Dear Mr. Jim Minnick,

On behalf of myself, Regina Victor, resident of Bombay Beach, I am pleased to offer scoping comments for Imperial County's Program Environmental Impact Report (PEIR) for the proposed Lithium Valley Specific Plan Project (Project) (SP22-0001). We understand that the Lithium Valley Specific Plan and PEIR is intended to provide a framework and guidance for the necessary infrastructure and facilities and streamline the development and permitting of additional renewable energy facilities, mineral recovery, lithium battery manufacturing, and other renewable industries within an approximately 51,786-acre area adjacent to the Salton Sea. Currently, the Imperial County Planning & Development Services Department is seeking the community's comments about the effects this project might have on the environment and suggestions as to alternatives, mitigation or ways the project may be revised to reduce or avoid any significant environmental impacts.

I would like to recommend that the following topics be analyzed in the PEIR:
Aesthetics
Agriculture and Forestry Resources
Air Quality
Biological Resources
Cultural Resources
Cumulative Effects
Drainage/Absorption
Geology/Soils

Hazards & Hazardous Materials
Hydrology/Water Quality
Land Use/Planning
Mineral Resources
Noise
Population/Housing
Public Services
Recreation
Schools/Universities
Septic System
Sewer Capacity
Solid Waste
Transportation
Vegetation
Wetland/Riparian
Wildfire
The future levels of the Salton Sea body of water
The long term plan to prevent stranded infrastructure
Overall project cleanup agenda
Making sure that cleanup costs don't fall upon the town/county/state people and taxpayers
The companies involved will be held responsible for any environmental disaster, no matter how big or how small.

These topics listed above are of great concern because of the environmental impact that it will have on myself, my property, and the surrounding community, be it direct, indirect, or cumulative impacts. The analysis should consider the impacts of these topics because of the importance of the impact on the geography, and affected populations within Imperial County. Thank you for taking the time to consider my suggested topics for analysis. I am looking forward to seeing my comments reflected in the draft of the Programmatic Environmental Impact Review for the Lithium Valley Specific Plan.

We would need a lot of time and conversation to really understand the impact. Local health is a priority as it is already a strain in our small community. Who will be most affected by this? By location? By demographic?

Best regards,
Regina Victor
Resident of Bombay Beach, CA

February 19, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Noise
Resident Name: Renata Carvalho
Resident City/Town: Bombay Beach

Scoping Comments:
I'm Renata, I'm an independent artist and filmmaker, who spends winters in Bombay Beach. Please study the impacts on the quality of life of both people and wildlife of rezoning this area in terms of the increase of noise pollution in the region.

Consider the impacts of all activities to take place with the rezoning: building, manufacture, mining and transportation. Consider mitigation options, like making the roads and railroad far enough from the inhabited areas, having building take place only during business hours.

Keegan Kingsbury

From: Rick Belding <rickb-interests@stanfordalumni.org>
Sent: Monday, February 12, 2024 2:22 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

This analysis should carefully consider cumulative impacts on the entire Imperial County Air Pollution Control District, which is already severely degraded. Any worsening air quality would significantly impact public health and likely exceed legal thresholds, which must be analyzed and mitigated. Given these concerns, please consider a project alternative requiring no reduced inflow to the Salton Sea.

Thank you.

Sincerely,
Rick Belding
800 Olive Glen Ct
Santa Rosa, CA 95404

February 20, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Air Quality, Other
Resident Name: Rita Flores
Resident Town: Niland

Scoping Comments:
Me impacta saber que nos están preguntando y que nos están tomando en cuenta y ustedes saben todo lo que va a pasar si ponen el litio, pues nos afectará en salud, aire contaminado, y por eso va a ver muchas enfermedades, además nunca se ven mejoras. En Niland solo vienen y instalan sus empresas pues nunca nos comunican qué beneficios tenemos. Les pido por favor que tomen en cuenta todas nuestras formas y nos ayuden a hacer mejoras a Niland.

English Translation: "I am shocked to know that they are asking us and that they are taking us into account and you know what is going to happen if they put lithium, because it will affect our health, polluted air, and that is why there will be many diseases, besides improvements are never seen. In Niland they just come and install their companies and never tell us what benefits we have. I ask you to please take into account all our ways and help us to make improvements to Niland."

Keegan Kingsbury

From: Robert Hall <bilgepump100@sbcglobal.net>
Sent: Monday, February 12, 2024 2:47 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

This analysis should carefully consider cumulative impacts on the entire Imperial County Air Pollution Control District, which is already severely degraded. Any worsening air quality would significantly impact public health and likely exceed legal thresholds, which must be analyzed and mitigated. Given these concerns, please consider a project alternative requiring no reduced inflow to the Salton Sea.

Thank you.

Sincerely,
Robert Hall
1946 Grove St. Apt. 6
San Francisco, CA 94117

February 19, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Hydrology, air quality
Resident Name: Robert Quinn
Resident City/Town: Niland/Bombay Beach

Scoping Comments:
The Salton Sea is dying, the water loss/evaporation is accelerating, our birds are largely gone, the “new” wetlands are now going to be rezoned for the most part. Our air quality is bad and getting worse. Our fresh water/aquifer level is overtaxed even without the massive amount of acre feet needed for this new project.

Bring salt water to the Salton Sea. Remove High salinity water if possible. Conserve bird habitats. Look into air quality issues from a shrinking sea and failed dust mitigation programs. Create long-term programs for saving the Salton Sea.

February 20, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Biological Resources, Hydrology/Water Quality, Land Use/Planning, Mineral Resources, Vegetation
Resident Name: Roberto Veliz
Resident City/Town: Calexico

Scoping Comments:

I am a Calexico resident worried about the extraction industries that are eager to break ground without taking into consideration the challenges that already exist in the Imperial Valley.

Water consumption is one concern. Will mining companies also have water restrictions during droughts? If not, then I don't think this project should move forward.

I'm also concerned about companies leaving without any accountability or possibly declaring bankruptcy should an environmental disaster occur. Will there be performance bonds or funds in case companies leave an environmental wasteland and injured workers? How can companies be held accountable at the state and federal levels should they damage a delicate habitat?

Keegan Kingsbury

From: Romona Czichos-Slaughter <lonestarr@sbcglobal.net>
Sent: Monday, February 12, 2024 8:57 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

This analysis should carefully consider cumulative impacts on the entire Imperial County Air Pollution Control District, which is already severely degraded. Any worsening air quality would significantly impact public health and likely exceed legal thresholds, which must be analyzed and mitigated. Given these concerns, please consider a project alternative requiring no reduced inflow to the Salton Sea.

Thank you.

Sincerely,
Romona Czichos-Slaughter
1210 Manzanita Drive
Hollister, CA 95023

Keegan Kingsbury

From: Ronit Corry <ronit@worldshare.net>
Sent: Tuesday, February 13, 2024 11:45 AM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

This analysis should carefully consider cumulative impacts on the entire Imperial County Air Pollution Control District, which is already severely degraded. Any worsening air quality would significantly impact public health and likely exceed legal thresholds, which must be analyzed and mitigated. Given these concerns, please consider a project alternative requiring no reduced inflow to the Salton Sea.

Thank you.

Sincerely,
Ronit Corry
1711 Pampas Ave
Santa Barbara, CA 93101

From: ruben avendano
To: Jim Minnick
Subject: Imperial County's Program Environmental Impact Review for the Lithium Valley Specific Plan
Date: Tuesday, February 20, 2024 10:53:04 AM

Dear Mr. Jim Minnick,

On behalf of myself, Ruben Avendano, resident of Bombay Beach, I am pleased to offer scoping comments for Imperial County's Program Environmental Impact Report (PEIR) for the proposed Lithium Valley Specific Plan Project (Project) (SP22-0001). We understand that the Lithium Valley Specific Plan and PEIR is intended to provide a framework and guidance for the necessary infrastructure and facilities and streamline the development and permitting of additional renewable energy facilities, mineral recovery, lithium battery manufacturing, and other renewable industries within an approximately 51,786-acre area adjacent to the Salton Sea. Currently, the Imperial County Planning & Development Services Department is seeking the community's comments about the effects this project might have on the environment and suggestions as to alternatives, mitigation or ways the project may be revised to reduce or avoid any significant environmental impacts.

I, Ruben Avendano, would like to recommend that the following topics be analyzed in the PEIR:
Aesthetics
Agriculture and Forestry Resources
Air Quality
Biological Resources
Cultural Resources
Cumulative Effects
Drainage/Absorption
Geology/Soils

Hazards & Hazardous Materials
Hydrology/Water Quality
Land Use/Planning
Mineral Resources
Noise
Population/Housing
Public Services
Recreation
Schools/Universities
Septic System
Sewer Capacity
Solid Waste
Transportation
Vegetation
Wetland/Riparian
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The future levels of the Salton Sea body of water
The long term plan to prevent stranded infrastructure
Overall project cleanup agenda
Making sure that cleanup costs don't fall upon the town/county/state people and taxpayers
The companies involved will be held responsible for any environmental disaster, no matter how big or how small.

These topics listed above are of great concern because of the environmental impact that it will have on myself, my property, and the surrounding community, be it direct, indirect, or cumulative impacts. The analysis should consider the impacts of these topics because of the importance of the impact on the geography, and affected populations within Imperial County.

Thank you for taking the time to consider my suggested topics for analysis. I am looking forward to seeing my comments reflected

in the draft of the Programmatic Environmental Impact Review for the Lithium Valley Specific Plan.

Best regards,
Ruben Avendano
Resident of Bombay Beach, CA

Keegan Kingsbury

From: Sara Patterson <saralpatterson@outlook.com>
Sent: Monday, February 19, 2024 8:28 AM
To: Jim Minnick
Subject: Lithium Valley Specific Plan Scoping Comments

Good Morning Jim,

I am a resident and property owner in Bombay Beach, CA. I recently moved here from Idaho because I enjoy the views of the Salton Sea and excited about the cultural renaissance that is happening here.

While the recent discovery of the world's largest supply of Lithium here sounds exciting because of the potential economic growth and potential new jobs it could add to the area, I am concerned about the effect the mining will have on the environment, particularly in regard to the consumption of fresh water that the mining would require and subsequent potential further recession of the Salton Sea.

The Salton Sea is already an ecological disaster that needs to be remedied. I would like to know what measures would be in place to require mining companies to actually improve and restore the water quality so that the Sea could again be home to fish and birds and human recreation. I would also like to know how the lithium will be taxed as it is extracted and how that money will be used to ensure the ecological safety and future of the area and its residents.

As residents of the area, we need to know specifically how much water will be used as the lithium is mined, how it will be cleaned and replaced so that there is no net loss of fresh water to the area, any desalination plans to safely restore the Salton Sea to normal salinity levels, and what pollution control measures will be in place to deal with the already existing issue of agricultural runoff.

We also need to know exactly how the mining companies will be held accountable, how they will be taxed, and what the potential financial impact of the taxes could be to the area. The taxes need to be spent responsibly and with education to the community. As an example, the exorbitant amount of money spent on the straw bale project has left residents concerned and confused about how the funds were spent and what purpose they serve. We need better communication channels to inform residents about Lithium Valley plans and voting procedures.

Thank you for your consideration.

Sincerely,

Sara Patterson
9555 - 9559 Avenue E, Niland, CA 92257
858.261.1757

Keegan Kingsbury

From: Sara Patterson <saralpatterson@outlook.com>
Sent: Monday, February 19, 2024 4:16 PM
To: Jim Minnick
Subject: Lithium Valley Urgent Matters

Greetings,

I am a Bombay Beach resident who recently attended a last minute Equity & Justice Coalition meeting to finally inform our community about pending Lithium Valley proposals that include major rezoning and significant increases to water usage.

We are incredibly concerned about the proposal to rezone Niland and Calipatria areas. Where are the projections about how many people will be displaced from their homes as a result of this rezoning? Will there be eminent domain being used? This rezoning cannot possibly be considered until there are projections about people who are going to lose their homes, how they will be compensated, and where they will find suitable new housing.

Further, we are absolutely astonished that anything would be considered that would increase water consumption in the area. Based on the preferred use alternative, the projection is that it will require 135,000 AFY. Where is this water going to come from? Will our drinking water be stolen and reallocated? Will it come from the Salton Sea causing a further escalation of the existing ecological crisis? This proposal cannot be considered until the question of where the water will come from is answered. There are no magical water fairies that I am aware of. The only possible place the water can come from is the ocean and until there are billions of dollars in lithium tax revenue approved for a project of such an undertaking, it must be turned down.

The only alternative that exists is to revisit the plan to desalinate water in the Gulf of California and send it to the Salton Sea. This plan was rejected in October 2022 because it was projected to cost too much and take too long to undertake. Since that time, we have learned that the amount of Lithium to be extracted is far greater than what was originally known. Because circumstances have changed regarding the amount of Lithium and its value, it is time to revisit the plan to desalinate water in the Gulf of California for restoring the ecological health of the Salton Sea and ensuring enough fresh water for its wildlife, residents, and the proposed increase in existing lithium mining.

We must answer the question of where the water is going to come from before allowing the Lithium Valley Specific Plan to proceed.

Thank You,

Sara Patterson
9555-9559 Avenue E, Niland, CA 92257
858.261.1757

February 19, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Drainage/Absorption, Geology/Soils, Hazards and Hazardous Materials, Hydrology/Water Quality, Land Use/Planning, Mineral Resources / Recursos minerales, Septic System, Wetland/Riparian
Resident Name: Sara Patterson
Resident City/Town: Niland

Scoping Comments:
While the recent discovery of the world's largest supply of Lithium here sounds exciting because of the potential economic growth and potential new jobs it could add to the area, I am concerned about the effect the mining will have on the environment, particularly in regard to the consumption of fresh water that the mining would require and subsequent potential further recession of the Salton Sea.

The Salton Sea is already an ecological disaster that needs to be remedied. I would like to know what measures would be in place to require mining companies to actually improve and restore the water quality so that the Sea could again be home to fish and birds and human recreation. I would also like to know how the lithium will be taxed as it is extracted and how that money will be used to ensure the ecological safety and future of the area and its residents.

As residents of the area, we need to know specifically how much water will be used as the lithium is mined, how it will be cleaned and replaced so that there is no net loss of fresh water to the area, any desalination plans to safely restore the Salton Sea to normal salinity levels, and what pollution control measures will be in place to deal with the already existing issue of agricultural runoff.

We also need to know exactly how the mining companies will be held accountable, how they will be taxed, and what the potential financial impact of the taxes could be to the area. The taxes need to be spent responsibly and with education to the community. As

an example, the exorbitant amount of money spent on the straw bale project has left residents concerned and confused about how the funds were spent and what purpose they serve. We need better communication channels to inform residents about Lithium Valley plans and voting procedures.

Thank you for your consideration.

Sincerely,

Sara Patterson
9555 - 9559 Avenue E, Niland, CA 92257
858.261.1757

February 19, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topi, Cultural resources, Cumulative Effects, Drainage/Absorption, Geology/Soils, Hazards and Hazardous, Hydrology/Water Quality, Land Use/Planning, Mineral Resources, Noise, Population/Housing, Public Services, Recreation, Schools/Universities, Septic System, Sewer Capacity/Solid Waste, Transportation, Vegetation, Wetland/Riparian, Wildfire, Other
Resident Name: Sara Patterson
Resident City/Town: Bombay Beach

Scoping Comments:
I am a Bombay Beach resident who recently attended a last minute Equity & Justice Coalition meeting to finally inform our community about pending Lithium Valley proposals that include major rezoning and significant increases to water usage.

We are incredibly concerned about the proposal to rezone Niland and Calipatria areas. Where are the projections about how many people will be displaced from their homes as a result of this rezoning? Will there be eminent domain being used? This rezoning cannot possibly be considered until there are projections about people who are going to lose their homes, how they will be compensated, and where they will find suitable new housing.

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The only alternative that exists is to revisit the plan to desalinate water in the Gulf of California and send it to the Salton Sea. This plan was rejected in October 2022 because it was projected to cost too much and take too long to undertake. Since that time, we have learned that the amount of Lithium to be extracted is far greater than what was originally known. Because circumstances have changed regarding the amount of Lithium and its value, it is time to revisit the plan to desalinate water in the Gulf of California for restoring the ecological health of the Salton Sea and ensuring enough fresh water for its wildlife, residents, and the proposed increase in existing lithium mining.

We must answer the question of where the water is going to come from before allowing the Lithium Valley Specific Plan to proceed.

Thank You,

Sara Patterson
9555-9559 Avenue E, Niland, CA 92257
858.261.1757

February 19, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Aesthetics, Agriculture and Forestry, Air Quality, Biological Resources, Cultural resources, Cumulative Effects, Drainage/Absorption, Geology/Soils, Hazards and Hazardous Materials, Hydrology/Water Quality, Land Use/Planning, Noise, Population/Housing, Public Services, Recreation, Septic System, Sewer Capacity/Solid Waste, Transportation, Vegetation, Wetland/Riparian, Other
Resident Name: Sarah Larsen
Resident City/Town: Bombay Beach

Scoping Comments:
I'm an artist in Bombay Beach, writing in concern for the cumulative issues around the development of Lithium Valley and the impact it'll have on the surrounding towns and environment.

These topics listed above are of great concern because of the environmental impact that it will have on myself, the properties I stay on, and the surrounding community I am a part of. The analysis should consider the impacts of these topics because of the importance of the impact on the geography, and affected populations within Imperial County.

Keegan Kingsbury

From: Scott Emsley <rowdy205@sbcglobal.net>
Sent: Monday, February 12, 2024 3:42 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

This analysis should carefully consider cumulative impacts on the entire Imperial County Air Pollution Control District, which is already severely degraded. Any worsening air quality would significantly impact public health and likely exceed legal thresholds, which must be analyzed and mitigated. Given these concerns, please consider a project alternative requiring no reduced inflow to the Salton Sea.

Thank you.

Sincerely,
Scott Emsley
10 Mal Paso Rd
Carmel, CA 93923

Keegan Kingsbury

From: Shari Riffe <shari.riffe@sbcglobal.net>
Sent: Tuesday, February 13, 2024 10:25 AM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

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Thank you.

Sincerely,
Shari Riffe
391 Camino Las Juntas
Pleasant Hill, CA 94523

Keegan Kingsbury

From: Sharon kaplan <vegansha@sbcglobal.net>
Sent: Monday, February 12, 2024 3:15 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

This analysis should carefully consider cumulative impacts on the entire Imperial County Air Pollution Control District, which is already severely degraded. Any worsening air quality would significantly impact public health and likely exceed legal thresholds, which must be analyzed and mitigated. Given these concerns, please consider a project alternative requiring no reduced inflow to the Salton Sea.

Thank you.

Sincerely,
Sharon kaplan
309 Plateau Ave
Santa Cruz, CA 95060

February 19, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Air Quality, Cumulative Effects, Hydrology/Water Quality, Wetland/Riparian
Resident Name: Sonia Herbert
Resident City/Town: Bombay Beach

Scoping Comments:

Sonia Herbert, resident of Bombay Beach since 1974, the need for more water in the Salton Sea is badly needed, the birds, fish, and residents all depend on this beautiful area. You must not dry up this potential recreation area for California.

To bring the Salton Sea back to its normal level would eliminate all the problems now and in the future (toxic) dust, becoming a wasteland. The beauty and scenic view of the water, mountains, are of much commerce coming to our communities, people from all over the world! Drying the Sea would greatly impact the whole region forever.

Elon Musk has a plan to bring in water from Carlsbad California, 75 miles through the mountain, pipe in pipe out, bringing the Sea to a healthy level at ⅓ of the cost of proposed plans. There is no other way except more water for the sea and less for lithium!

February 20, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Aesthetics, Agriculture and Forestry, Air Quality, Biological Resources, Cultural resources, Cumulative Effects, Drainage/Absorption, Geology/Soils, Hazards and Hazardous Materials, Hydrology/Water Quality, Land Use/Planning, Mineral Resources, Noise, Population/Housing, Public Services, Recreation, Schools/Universities, Septic System, Sewer Capacity/Solid Waste, Transportation, Vegetation, Wetland/Riparian, Wildfire
Resident Name: Sophia Mickelson
Resident City/Town: Bombay Beach

Scoping Comments:

Hi I'm Sophia and I am a resident in Bombay beach. My concerns are for the long lasting impact of this development specifically on the environmental wellness of the salton sea and for the residents who the development will affect.

February 20, 2023

Jim Minnick
Director
Imperial County Planning and Development Services Department
801 Main Street
El Centro, CA 92243
dianarobinson@co.imperial.ca.us

Subject: **Comments on Notice of Preparation for Lithium Valley Specific Plan and Programmatic Environmental Impact Report Project (SP#22-0001; SCH #2023120104)**

Dear Mr. Minnick,

Salton Sea Lithium Extraction Committee (SSLEC) has reviewed the Notice of Preparation (NOP) and Initial Study for the Lithium Valley Specific Plan (SP) dated December 2023. The Specific Plan Area (SPA) that is addressed in the Initial Study includes a portion of the Salton Sea Known Geothermal Resource Area (KGRA). The northern boundary of the SPA is limited to approximately the Imperial Irrigation District Z lateral. The limits of the Salton Sea KGRA were previously defined by the U.S. Geological Survey as shown in Figure 1.1, and extend north of the SPA by over 2 miles.

Salton Sea KGRA Lithium Resource Estimate

In November 2023, the U.S Department of Energy Lawrence Berkeley National Laboratory published a paper estimating lithium carbonate equivalent (LCE) production capacity from geothermal brines in the Salton Sea KGRA including[1]:

- 130,000 to 150,000 metric tons (MT) LCE from existing geothermal production facilities
- 290,000 to 350,000 MT LCE from projected geothermal capacity with an addition 520 megawatts (MW) of planned geothermal expansion
- 950,000 to 1,100,000 MT LCE from possible geothermal capacity of 2,950 MW

The latter estimate assumes extraction of lithium from geothermal brines throughout the Salton Sea geothermal field, including portions of the Salton Sea KGRA north of the SPA.

[1] Dobson, Araya, Brounce, et al. 2023 *Characterizing the Geothermal Lithium Resource at the Salton Sea.* U.C. Davis. https://escholarship.org/uc/item/4x8868mf

Comments on Specific Plan

The Initial Study for the Lithium Valley Specific Plan states that "the goal of the Project is to frame and guide the development of renewable energy sources, such as geothermal and solar energy, as well as lithium extraction and associated industrial uses and infrastructure improvements." The SP not only limits the northern boundary of the SPA, it further limits the areas for geothermal and lithium extraction within the SPA to areas designated as "Green Industrial". The areas designated as "Green Industrial" in the SP reflect those areas where geothermal resources have already been developed or where they are currently in planning stages (e.g., Black Rock Geothermal Project[2]). By limiting the area of geothermal and lithium extraction to areas of existing and planned extraction, the SP could potentially limit the lithium extraction capacity at the Salton Sea to the planned geothermal expansion estimate of 290,000 to 350,000 MT LCE and not achieve the much larger potential lithium extraction estimate of 950,000 to 1,100,000 MT LCE. The limitation imposed on areas of Green Industrial would also not meet the intended SP goal of guiding development of renewable energy source including geothermal and lithium extraction as the SP limits the areas of geothermal and lithium extraction to areas where development has already occurred and where applications for development have already been filed.

SSLEC has filed mining claims for lithium extraction within the northern portion of the Salton Sea KGRA. SSLEC lithium extraction operations are currently planned to occur on federal lands administered by U.S. Bureau of Land Management and private lands under Imperial County jurisdiction. SSLEC's planned facilities within Imperial County jurisdiction are located within the Renewable Energy Overlay Zone[3], where geothermal energy production, including minerals extraction is conditionally approved in accordance with the County General Plan Renewable Energy and Transmission Element. Because the stated goal of the SP is to guide development of renewable energy sources, the County needs to address whether lithium extraction from geothermal brines outside of the SP would require an amendment to the SP to incorporate those areas into the SP or whether the areas outside of the SP would be governed by the existing General Plan and zoning ordinances. If the County would require an amendment to the SP for lithium extraction outside of the SPA, the SP needs to define a streamlined process for amending the SP so that the SP does not inadvertently limit future lithium extraction from the Salton Sea and thereby limit economic activity in the region.

Should you wish to discuss these comments further, please feel free to contact me at adam@sslithium.com or 385.315.0024.

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[2] Black Rock Geothermal Project (BRGP). 2023. *Black Rock Geothermal Project Application for Certification.* April 18, 2023. https://www.energy.ca.gov/powerplant/steam-turbine/black-rock-geothermal-project-brgp

[3] Imperial County and California Energy Commission. 2015. *Renewable Energy and Transmission Element County of Imperial General Plan.*

Sincerely,

Adam Schumaker

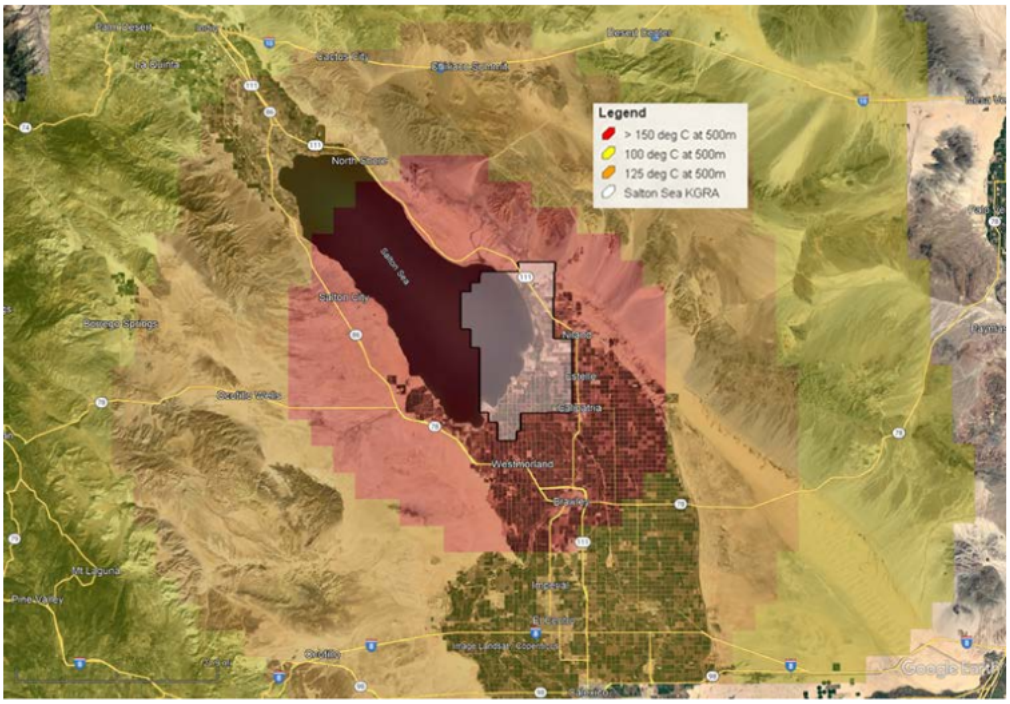

Figure 1.1. Location of the Salton Sea Known Geothermal Resource Area (SS-KGRA), shaded gray and outlined in black. Shading represents subsurface temperatures at 500 meters below ground surface (USGS data). The SS-KGRA is located in Imperial County, California.

Source: (Dobson, 2023)

Lithium Valley Specific Plan Scoping Comment (1)

IMPACT

- Introduce yourself
- State your purpose for writing, and the potential impacts that concern you.
- Tips: Be specific by stating the direct, indirect, or cumulative impact you want studied. Avoid stating an opinion.

Stephanie Cate - Bombay Beach Resident

I'm concerned about air quality impact and where the source of all the water needed for lithium production is planned to originate from.

I would like answers to these above concerns.

SIGNIFICANCE

- Describe the significance of the impact.
- Describe how much planning is needed to really understand how the changes will affect your community. This includes how long the effects will last, where they will happen, and who in our community will be impacted.
- Provide support as to why this impact is foreseeable.

Where the water needed for lithium production is taken from is a great concern given the precarious water supply shortage in the area already. Will ground water be contaminated?

Will water be taken from agriculture?

ALTERNATIVES

- Discuss the alternatives you want the study to consider, including: A) no action alternative where the project isn't permitted, B) the proposal with mitigations, C) other reasonable courses of action.

Desalinization plant for self sufficient water usage, is the suggestion offered. And aid in maintaining and increasing water level in the Salton Sea for the benefit of wildlife and community.

Submit your comments

via email
Jim Minnick
JimMinnick@co.imperial.ca.us

OR

through postal services or in-person:
Imperial County Planning & Development Services Department
801 Main Street, El Centro, CA 92243

2/20/24

Keegan Kingsbury

From: Steven Kassel <s@kassel.us>
Sent: Monday, February 12, 2024 3:50 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

This analysis should carefully consider cumulative impacts on the entire Imperial County Air Pollution Control District, which is already severely degraded. Any worsening air quality would significantly impact public health and likely exceed legal thresholds, which must be analyzed and mitigated. Given these concerns, please consider a project alternative requiring no reduced inflow to the Salton Sea.

Thank you.

Sincerely,
Steven Kassel
26266 Prima Way
Santa Clarita, CA 91350

February 19, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Hazards and hazardous materials, hydrology, water quality, Vegetation, other
Resident Name: Steven Sharbreh
Resident City/Town: Bombay Beach

Scoping Comments:
I'm Steven Sharbreh, a resident of Bombay Beach concerned with the mining of lithium in our Salton Sea area. It is known to cause effects to the thyroid glands, kidneys, and respiratory system.

The decrease of the Salton Sea water is a huge health concern due to the mining of lithium in our area. Wildlife is another huge concern in our area.

Need to restore the water source back to the Salton Sea due practically to the mining of lithium.

February 19, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Aesthetics, Agriculture and Forestry, Air Quality, Biological Resources, Cultural resources, Cumulative Effects, Drainage/Absorption, Geology/Soils, Hazards and Hazardous Materials, Hydrology/Water Quality, Land Use/Planning, Mineral Resources, Noise, Population/Housing, Public Services, Recreation, Schools/Universities, Septic System, Sewer Capacity/Solid Waste, Transportation, Vegetation, Wetland/Riparian, Wildfire, Other
Resident Name: Tala Satele
Resident City/Town: Bombay Beach

Scoping Comments:

Dear Mr. Jim Minnick,
On behalf of myself, Tala Satele, resident of Bombay Beach, I am pleased to offer scoping comments for Imperial County's Program Environmental Impact Report (PEIR) for the proposed Lithium Valley Specific Plan Project (Project) (SP22-0001). We understand that the Lithium Valley Specific Plan and PEIR is intended to provide a framework and guidance for the necessary infrastructure and facilities and streamline the development and permitting of additional renewable energy facilities, mineral recovery, lithium battery manufacturing, and other renewable industries within an approximately 51,786-acre area adjacent to the Salton Sea. Currently, the Imperial County Planning & Development Services Department is seeking the community's comments about the effects this project might have on the environment and suggestions as to alternatives, mitigation or ways the project may be revised to reduce or avoid any significant environmental impacts.

I, Tala Satele, would like to recommend that the following topics be analyzed in the PEIR:
Aesthetics
Agriculture and Forestry Resources

Air Quality
Biological Resources
Cultural Resources
Cumulative Effects
Drainage/Absorption
Geology/Soils
Hazards & Hazardous Materials
Hydrology/Water Quality
Land Use/Planning
Mineral Resources
Noise
Population/Housing
Public Services
Recreation
Schools/Universities
Septic System
Sewer Capacity
Solid Waste
Transportation
Vegetation
Wetland/Riparian
Wildfire
The future levels of the Salton Sea body of water
The long term plan to prevent stranded infrastructure
Overall project cleanup agenda
Making sure that cleanup costs don't fall upon the town/county/state people and taxpayers
The companies involved will be held responsible for any environmental disaster, no matter how big or how small.

These topics listed above are of great concern because of the environmental impact that it will have on myself, my property, and the surrounding community, be it direct, indirect, or cumulative impacts. The analysis should consider the impacts of these topics because of the importance of the impact on the geography, and affected populations within Imperial County.
Thank you for taking the time to consider my suggested topics for analysis. I am looking forward to seeing my comments reflected in the draft of the Programmatic Environmental Impact Review
for the Lithium Valley Specific Plan.

Best regards,
Tala Satele
Resident of Bombay Beach, CA

February 19, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Aesthetics, air quality, cumulative effects, land use/planning, mineral resources, septic system, sewer capacity/solid waste
Resident Name: Tao Rusroy
Resident City/Town: Bombay Beach

Scoping Comments:
I am a homeowner and co-founder of Bombay Beach Biennale. Please research any and all impact to Bombay and Salton Sea.

Keegan Kingsbury

From: Tem Narvios <winevitable@sbcglobal.net>
Sent: Tuesday, February 13, 2024 4:15 AM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

This analysis should carefully consider cumulative impacts on the entire Imperial County Air Pollution Control District, which is already severely degraded. Any worsening air quality would significantly impact public health and likely exceed legal thresholds, which must be analyzed and mitigated. Given these concerns, please consider a project alternative requiring no reduced inflow to the Salton Sea.

Thank you.

Sincerely,
Tem Narvios
1425 Visitacion Ave
San Francisco, CA 94134

Keegan Kingsbury

From: Terri Decker <firefox8565@sbcglobal.net>
Sent: Monday, February 12, 2024 3:52 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

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Thank you.

Sincerely,
Terri Decker
8565 Placer Rd
Redding, CA 96001

Keegan Kingsbury

From: TIA TRIPLETT <tia@anlf.com>
Sent: Tuesday, February 13, 2024 10:38 AM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

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This analysis should carefully consider cumulative impacts on the entire Imperial County Air Pollution Control District, which is already severely degraded. Any worsening air quality would significantly impact public health and likely exceed legal thresholds, which must be analyzed and mitigated. Given these concerns, please consider a project alternative requiring no reduced inflow to the Salton Sea.

Thank you.

Sincerely,
TIA TRIPLETT
3959 Berryman Ave
Los Angeles, CA 90066

Keegan Kingsbury

From: Trish Gilbert <patricia.gilbert@parks.ca.gov>
Sent: Monday, February 12, 2024 1:09 PM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

This analysis should carefully consider cumulative impacts on the entire Imperial County Air Pollution Control District, which is already severely degraded. Any worsening air quality would significantly impact public health and likely exceed legal thresholds, which must be analyzed and mitigated. Given these concerns, please consider a project alternative requiring no reduced inflow to the Salton Sea.

Thank you.

Sincerely,
Trish Gilbert
2341 Rainbow Ave
Sacramento, CA 95821

Region 6

Mike Miller
Director
Victor Quiroz
Assistant Director

INTERNATIONAL UNION, UNITED AUTOMOBILE, AEROSPACE & AGRICULTURAL IMPLEMENT WORKERS OF AMERICA - UAW

6500 S. ROSEMEAD BLVD.
PICO RIVERA, CA 90660-3532
PHONE: (562) 801-1500

February 19, 2024

Jim Minnick
Director, Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

RE: NOTICE OF PREPARATION OF DRAFT PROGRAM EIR FOR THE LITHIUM VALLEY SPECIFIC PLAN

Dear Director Minnick,

The United Auto Workers union (UAW) represents nearly 100,000 active and retired workers in California and over 1,000,0000 active and retired workers nationwide. Our members do the work that will power the transition to a green economy, from the research and development that develops new technologies to the manufacturing and assembly work that will mass produce them. UAW believes in a green future in which everybody can afford an electric vehicle and electric vehicle and battery jobs are good, family-supporting jobs. The lithium deposits in Imperial County can play a big role in realizing this vision, but ensuring that the promises of lithium extraction are fully realized will require careful planning.

Research from Lawrence Berkeley National Laboratory indicates there is enough lithium in Imperial County to power over 300,000,000 electric vehicles. If later stages of the lithium value chain are built out in the area, lithium extraction could catalyze the creation of tens of thousands of good jobs. But despite these promises, there are many hazards associated with the production of lithium batteries and electric vehicles. Dozens of UAW members currently live and work in Imperial County, and UAW is submitting this scoping comment to ensure that the Lithium Valley PEIR adequately addresses all relevant hazards so that the local environment is not further degraded for these or any other community members, current or future. Imperial County will need to use every tool at its disposal to mitigate the environmental harms associated with lithium extraction and related industries while ensuring that jobs in new industries are high road jobs. As such, UAW asks that Imperial County Planning & Development Services study thoroughly the topics and issues mentioned below.

Air quality
There are major air quality hazards associated with the construction and operation of Direct Lithium Extraction facilities and facilities for related industries like battery manufacturing. Some of these hazards are related to the possible exposure of the Salton Sea lake bed due to reduced inflow of water. The PEIR should study that increased exposure of the lake bed will have on air quality, especially via known pollutants such as magnesium, sulfates, calcium, and strontium (Naimark, 2023). The PEIR should also study opportunities to mitigate these pollutants via the restoration of the lake bed.

According to the Application for Certification (AFC) submitted by Berkshire Hathaway Renewables (BHR), the company expects that their three proposed facilities will emit a series of toxic pollutants that includes carcinogenic

Radon (Salamy, 2023). Other sources have found that the geothermal brines in the Salton Sea contain additional radioactive elements, including uranium, thorium, cesium, and strontium. These toxic elements all have known impacts on human health, yet Berkshire Hathaway did not disclose them in their Application for Certification to the California Energy Commission (CEC). The company's stated reason for declining to disclose these emissions was that neither CARB nor the CalEPA require their disclosure. Therefore, the PEIR should study thoroughly the effects of radon emissions on human health at the levels likely to be seen in Imperial County, and it should study thoroughly the effects of *all* toxic emissions whether or not they are currently regulated by CARB and CalEPA. At minimum, the PEIR should consider all the toxic pollutants identified in Table 5.1-8 of Berkshire Hathaway's Application for Certification for the Black Rock Geothermal Project (this document can be found in the CEC Docket at docket number 23-AFC-03.). The PEIR should also consider mitigating these hazards by requiring reporting standards that address the cumulative total emissions across all possible facilities, and that go beyond the legally required minimums.

The production of lithium ion batteries also creates air quality hazards. For example, the company Tesla, which is the largest EV company in the United States and one of the largest battery companies in the United States, is ranked as the 84th largest corporate polluter in the United States by the University of Massachusetts Amherst Political Economy Research Institute (PERI) (PERI, 2023). The Tesla facility in Sparks, Nevada is the single biggest air polluter in the American automotive industry, primarily due to its cobalt emissions. The Nevada Division of Environmental Protection (NDEP) recently found that the Tesla facility in Sparks also produced emissions of volatile organic compounds, sulfur dioxide, nitrogen oxides, carbon monoxide and particulate matter (Hidalgo, 2022). The PEIR should study these known emissions as well as other possible emissions from lithium battery production. This study should include identifying all possible emissions, the levels at which they can be expected to emitted, and their health effects on surrounding communities at various levels of emission.

These air quality hazards vary greatly depending on the type of battery chemistry in question. Battery chemistries that use nickel and cobalt produce the most harmful emissions. The PEIR should study diligently the toxicity of nickel and cobalt emissions and should study mitigations that include limiting the types of allowable battery chemistries that can be used in the study area. The PEIR should consider that some emissions, such as cobalt, are not regulated by the EPA because of their relative newness. The PEIR must study ways to monitor emissions beyond the legal minimum to ensure Imperial County residents are not exposed to undue risk from well-documented but unregulated pollutants.

Hazardous Materials

Lithium extraction and related industries will create hazardous materials as byproducts. The EIR for Energy Source Minerals' ATLiS project contains a list of toxic byproducts from DLE that includes iron/silica filter cake, calcium/magnesium filter cake, boron ion exchange, manganese/zinc filter cake, and residual brine (Neimark, 2023). The PEIR should study the toxicity of these byproducts, the volumes in which they might be produced, and the options for either storing or disposing of them. To ensure materials are disposed of and handled safely, special attention should be paid to plans to export these materials, to either states or countries with more lax environmental laws than California. Any plans to transport or export by products should also be evaluated in terms of the carbon emissions produced by transporting them. A recent investigation of toxic waste recycling facilities in nearby Tecate, Mexico found that the export of toxics from California to Mexico has created an unregulated environmental disaster for communities neighboring recycling facilities (Lewis & Fry, 2023). The PEIR should find mitigations to prevent this from happening in the future.

Later stages of the lithium value chain, particularly battery production, also produce toxic materials. Workers in battery facilities are exposed to a variety of toxic materials on a daily basis. An investigation into working conditions at Ultium Cells in Lordstown, Ohio, which is currently the only unionized battery factory in the nation, found that poor management and lax safety practices created dangerous conditions for workers. Among the hazards workers identified were toxic electrolytes and toxic fumes, specifically chemicals known as Lucan BT1003M, lithium hexaflourophosphate (LiPF), ethylene carbonate (EC), ethyl methyl carbonate (EMC, and 1,3-Propanesultone (PS) (UAW, 2023). Poor safety practices led to workers inhaling these chemicals, these chemicals exploding, and workers

being burnt by chemical fires. The PEIR should explore ways hazardous chemicals can be regulated to ensure Imperial County workers do not suffer occupational industries like those described above. It must also be pointed out again that each battery chemistry is different. The hazards mentioned previously are specific to the Ultium chemistry. The PEIR must consider the toxic hazards associated with *every* possible battery chemistry that could be deployed in the study area. The PEIR must also consider how these materials will be transported to production facilities and propose mitigations to ensure they are transported safely.

The Ultium investigation revealed that Ultium workers are exposed to problems that other workers for Ultium's parent company, General Motors. are not because they lack the same level of rights and protections guaranteed in the UAW-GM National Agreement. For example, the UAW-GM National Agreement requires GM to limit chemical exposures to exposure thresholds established by the American Conference of Government Industrial Hygienists, which are more stringent than those established by OSHA (UAW, 2023). The union contract also requires regular air quality testing and a host of other protections. These protections are monitored by Local Joint Health and Safety Committees (LCHSCs) which contain representatives from both the union and management. The PEIR should consider these successful examples of mitigating the harms from toxic wastes and explore ways that empowering workers can be used to protect workers in Imperial County. More extensive description of these protocols can be found in UAW's publication *High Risk & Low Pay: A Case Study of Ultium Cells in Lordstown.*

There are additional hazardous wastes produced by electric vehicles and the electric vehicle supply chain that are not related to battery chemistry. A lawsuit recently filed by 25 California counties recently accused Tesla of systematically mishandling hazardous waste at 101 facilities including both its service centers and its Fremont assembly plant (The People of the State of California vs. Tesla, 2024a). The mismanaged materials include 'used lubricating oils, brake fluids, lead acid batteries, aerosols, antifreeze, waste solvents, paint, e-waste, and other contaminated debris' (Calma, 2024). As part of the lawsuit settlement agreement, Tesla has agreed to 3rd party audits of its hazardous waste (The People of the State of California vs. Tesla, 2024b). The PEIR should consider strict waste management requirements for companies to prevent situations like this from occurring in Imperial County, and it should consider mitigations including independent audits of waste management practice and the mandatory retention of waste management professionals.

Water Use

The PEIR must study the water needs for lithium extraction and related industries. Building out a lithium-based manufacturing ecosystem will likely require more water than the Imperial Irrigation District (IID) currently has allocated for non-agricultural uses. Given the existing state of environmental degradation of the Salton Sea and the toxic hazards related to it previously identified, the PEIR must find mitigations for increased water use that do not involve decreasing allocations to the Salton Sea.

Thank you for your attention to these issues. Should you have any questions, please do not hesitate to contact me at pdexter@uaw.net.

In solidarity,

Patrick Dexter
International Representative, UAW Region 6

PD:mg
opeiu494afl-co

References

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The People of the State of California vs. Tesla. Complaint for Permanent Injunction, and Civil Penalties Other Equitable Relief. 2024a. Superior Court of California, County of San Joaquin. https://cdn.vox-cdn.com/uploads/chorus_asset/file/25263863/Tesla_Complaint_Filed_013024__1_.pdf

The People of the State of California vs. Tesla. Stipulation of Entry for Final Judgment and Permanent Injunction. 2024b. Superior Court of California, County of San Joaquin. https://cdn.vox-cdn.com/uploads/chorus_asset/file/25263782/Stipulated_Judgment.pdf

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February 20, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Aesthetics, Agriculture and Forestry, Air Quality, Biological Resources, Cultural resources, Cumulative Effects, Drainage/Absorption Geology/Soils, Hazards and Hazardous Materials, Hydrology/Water Quality, Land Use/Planning, Mineral Resources, Noise, Population/Housing, Public Services, Recreation, Schools/Universities, Septic System, Sewer Capacity, Transportation, Vegetation, Wetland/Riparian, Wildfire, Other
Resident Name: Uwe H. Martin
Resident City/Town: Bombay Beach

Scoping Comments:

I have been a part-time resident and property owner in the community of Bombay Beach since 2017. I originally came here to document the water issues of the American West, Imperial Valley agriculture, and the shrinking of the Salton Sea.
As much as I see the development and permitting of additional renewable energy facilities, mineral recovery, lithium battery manufacturing, and other renewable industries as crucial to the region, I also have deep concerns about the environmental and social consequences this could bring upon our Salton Sea community.

I am especially concerned about and ask you to study in-depth: The water levels of the Salton Sea and connected issues, including air quality, wildlife, ecosystem services, etc: How much water will be used? Where is it coming from? Will it further reduce inflow into the Salton Sea? By how much? How will this affect the water levels of the Salton Sea over the next 30 years? How will the reduced inflow be mitigated to prevent Salton Sea water levels from further falling? Who pays for the additional water needed for the development? How much is paid by the users per acre-feet? Who profits from the water sale? Is the water sale to companies taxed, so that communities of the Salton Sea benefit? At which rate? How many acres of Playa will fall dry due to the development? How will the Playa be covered to prevent hazardous dust? Who will be liable for any

damages caused by the dust? How do you ensure that benefitting companies will be held liable for any damages caused directly, indirectly, or cumulative, instead of taxpayers shouldering the bill? How do you ensure resident access to the Salton Sea? Air pollution from playa dust, traffic, industries, etc.

How much additional light pollution is expected and how do you mitigate it?
What kind of impacts are expected on groundwater and aquifers? What chemicals are used in the process of mining the resources? What are their environmental impacts? How do you ensure transparency about used chemicals and prevent companies from claiming proprietary rights to this knowledge?

Is there any danger of land subsidence due to the extraction?

What kind of waste is produced by the industries? Where will it be discarded? How do you ensure the safe transport of hazardous waste?

What happens with existing wetlands in the area? How will they be protected? Will they be accessible to the community?

What is the long-term plan to prevent stranded infrastructure?
What is the overall project cleanup agenda?

How do you ensure that cleanup costs don't fall upon the town/county/state people and taxpayers?

How will the companies involved be held responsible for any environmental disaster, no matter how big or how small?

These topics listed above are of great concern because of the environmental impact this development could have on me, my property, and the surrounding community, be it direct, indirect, or cumulative impacts. The analysis should consider the impacts of these topics because of the importance of the impact on the geography, and affected populations within Imperial County.

Thank you for taking the time to consider my suggested topics for analysis. I am looking forward to seeing my comments reflected in the draft of the Programmatic Environmental Impact Review for the Lithium Valley Specific Plan.

February 19, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Air Quality, Cumulative Effects, Hazards and Hazardous Materials, Hydrology/Water Quality, Land Use/Planning, Sewer Capacity/Solid Waste, Vegetation, Wetland/Riparian, Wildfire
Resident Name: Valeria Landeros

Scoping Comments:
My name is Valeria Landeros and I am a City Planning masters student at SDSU and I think such a large scale project for lithium is irresponsible considering the grave environmental degradation that already exists in this region. We should not be investing in infrastructure for another polluting and dangerous industry for the sake or creating jobs. Whether or not this industry can create economic development it doesn't address WHO will be benefitted by that economic development.

Keegan Kingsbury

From: Vic Bostock <care4animals@hotmail.co.uk>
Sent: Tuesday, February 13, 2024 9:56 AM
To: Jim Minnick
Subject: Lithium Valley Program EIR scoping comment

Dear Director Minnick,

Dear Mr. Minnick,

I'm writing to submit my scoping comments for the Lithium Valley Program Environmental Impact Report. Please study the impacts of freshwater consumption in the Specific Plan Area.

This should include disclosing the specific plan's water supply and elaborating mitigation measures should there be water shortage due to extreme drought and negotiated cuts to Imperial County's Colorado River water. Furthermore, please study how the specific plan would reduce inflow to the Salton Sea. It is reasonably foreseeable that the project would speed up the Salton Sea's decline because the sea is fed by runoff from agricultural fields, which are now proposed to be converted to industrial zoning for lithium extraction. Please study how reduced inflow to the Salton Sea would indirectly impact air quality by exposing more lakebed and releasing toxic dust into the air.

This analysis should carefully consider cumulative impacts on the entire Imperial County Air Pollution Control District, which is already severely degraded. Any worsening air quality would significantly impact public health and likely exceed legal thresholds, which must be analyzed and mitigated. Given these concerns, please consider a project alternative requiring no reduced inflow to the Salton Sea.

Thank you.

Sincerely,
Vic Bostock
1612 Woodglen Ln
Altadena, CA 91001

February 19, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Air Quality, Other
Resident Name: Vicky Hernandez
Resident City/Town: Niland

Scoping Comments:

I live in Niland and I am concerned with worsening air quality issues in our area. People like myself already struggle breathing in Niland and I am worried that having more activity in this area will worsen the air quality situation. This impact can not only affect myself and my family but the children who attend Grace Smith School. They play outside and some of these students have asthma. I am worried that because of the air quality one of them will have an asthma attack with no medical presence nearby. Please study how the air quality will further burden our community because of the projects and please find an alternative that won't further worsen the air quality situation for our community.

February 19, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Aesthetics, Air Quality, Biological Resources, Cultural resource, Cumulative Effects, Hazards and Hazardous Materials, Hydrology/Water Quality / Hidrología, Population/Housing, Public Services, Recreation, Transportation, Wetland/Riparian
Resident Name: Victor Zazueta
Resident City/Town: Imperial

Scoping Comments:
Born and raised in Imperial County 72 years ago I have learned to love and respect our desert landscape, flora and fauna and the human history of this region. But after learning this process would turn over almost 82 square miles (52,000 acres) of county land to developers to use for specific and unspecified use I became alarmed. The promise of jobs and an expanded tax base have never panned out for us residents as evidenced by the continued high unemployment rates and unhoused population in this County. And I don't believe the promises from large corporations that there will be little to no environmental impacts. First off, the negative effect on local infrastructure has not been adequately detailed or examined. The impact on indigenous sacred sites has not been investigated sufficiently with the assistance of local tribal groups. And lastly the impact on water usage and air quality will suffer dramatically with not mitigation of these negative effects on the quality of life in our rural community far from both Sacramento and Washington.

Because this proposed lithium extraction process is mostly experimental it should be confined to a small footprint. We have seen the impacts of unbridled lithium extraction processes in Nevada and in Chile where open lithium ponds. https://www.euronews.com/green/2022/02/01/south-america-s-lithium-fields-reveal-the-dark-side-of-our-electric-future That is our fear should the experimental process fail these corporation will resort to lithium ponds.

February 19, 2024

Diana Robinson and Jim Minnick
Imperial County Planning & Development Services Department
801 Main Street
El Centro, CA 92243

Re: Draft Program Environmental Impact Review for the Lithium Valley Specific Plan - Scoping Comments

Environmental topics of concern: Aesthetics, Agriculture and Forestry, Air Quality, Biological Resources, Cultural resources, Cumulative Effects, Drainage/Absorption, Geology/Soils, Hazards and Hazardous Materials, Hydrology/Water Quality, Land Use/Planning, Mineral Resources, Noise, Population/Housing, Public Services, Recreation, Schools/Universities, Septic System, Sewer Capacity/Solid Waste, Transportation, Vegetation, Wetland/Riparian, Wildfire
Resident Name: Will
Resident City/Town: Bombay Beach

Scoping Comments:
I am a resident of Bombay Beach. I would like to see the abundance generated by mining of lithium to be invested in the area - addressing infrastructure, ecological health, keeping the salton sea level up, and cleaning up hazardous areas.

Lithium Valley Specific Plan Scoping Comment (1)

IMPACT

- Introduce yourself
- State your purpose for writing, and the potential impacts that concern you.
- Tips: Be specific by stating the direct, indirect, or cumulative impact you want studied. Avoid stating an opinion.

Yanglin Forms is my name
Study need for proper
water management

Yanglin Forms is my name. Study need for proper water management.

SIGNIFICANCE

- Describe the significance of the impact.
- Describe how much planning is needed to really understand how the changes will affect your community. This includes how long the effects will last, where they will happen, and who in our community will be impacted.
- Provide support as to why this impact is foreseeable.

Improvement in the
environmental
reality by proper
management of
the projects is not
desirable

Improvement in the environmental reality by proper management of the projects is not desirable.

alternatives

- Discuss the alternatives you want the study to consider, including: A) no action alternative where the project isn't permitted, B) the proposal with mitigations, C) other reasonable courses of action.

Let the chore be
for improvement
in more desirable
community statements.

Let the chores be for improvement in more desirable community statements.

Submit your comments

via email

Jim Minnick
JimMinnick(aco.imperial.ca.us

OR

through postal services or in-person;
Imperial County Planning & Development Services Department
801 Main Street, El Centro, CA 92243