THE DEVIL is in the DETAILS:

Environmental Health Impacts of the Hell's Kitchen Lithium and Power Project

Comite Civico del Valle and Earthworks | September 2025

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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.

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

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Lithium is important for making batteries, including those used in electric cars and for energy storage. One of the largest lithium resources in the world is found in Imperial Valley, California, located within a deposit of geothermal brine, deep beneath the southeast edge of the Salton Sea (Ancient Lake Cahuilla). **Developing a lithium battery supply chain in Imperial Valley is a chance to improve the economy and address climate change. But this novel industry comes with significant risks that need to be mitigated and subject to adequate oversight in a transparent fashion to the public.**

This report offers an overview of the environmental health impacts of direct lithium extraction (DLE) from geothermal brine. It provides recommendations to mitigate the harms and maximize benefits for affected communities and tribes. The report centers on a project that has raised serious concerns, the Hell's Kitchen Lithium and Power development proposed by Controlled Thermal Resources, Inc. (CTR) in Imperial Valley, California, which includes a 49.9 megawatt geothermal power plant and a DLE facility that would extract lithium from spent brine before it is reinjected back underground (i.e., the Project). The Project is stage 1 of CTR's proposed multi-stage concept of a Lithium Valley campus near the Salton Sea.

Even though it has been framed as green and clean, the Project will have significant environmental impacts. It will divert large volumes of freshwater from the Salton Sea, speeding up the recession of the shoreline and exacerbating poor air quality with dust pollution from the exposed lakebed. It will also produce hazardous waste that contains arsenic and lead. Moreover, the Hell's Kitchen Project is located within a sacred cultural landscape with documented tribal cultural resources in need of protection. Nonetheless, Imperial County approved the Project in 2024, leaving environmental justice communities and tribal nations at potential risk of being sacrificed in the rush to extract lithium for batteries used to power electric vehicles and energy grid storage.

Comite Civico del Valle (CCV) and Earthworks jointly filed litigation against Imperial County for violating the California Environmental Quality Act (CEQA) by approving the Hell's Kitchen Project based on a deeply flawed Environmental Impact Report (EIR) that:

- Failed to adequately analyze the impacts of increased industrial water consumption on the Salton Sea.
- Failed to adequately analyze cumulative air quality impacts and consider mitigation to reduce exposure for local communities that are already highly polluted.
- Failed to properly analyze the volume of solid waste by asserting non-lithium byproducts could be sold without any evidence to show marketability.
- Failed to provide meaningful tribal consultation, adequately consider local tribes' subject matter expertise, and failed to include tribal specific mitigation measures that have become fairly routine in other jurisdictions.
- Failed to analyze the reasonably foreseeable cumulative impacts from nearby projects, including water-intensive industrial projects, all phases of the Hell's Kitchen Project, or the County's water-intensive Lithium Valley Specific Plan that was well on its way at the time that CTR's draft EIR was released.
- Failed to consider any feasible project alternatives and enforceable mitigation that could have reduced environmental impacts.

CCV and Earthworks are not against direct lithium extraction in Imperial Valley. We want to see it done right. The lithium extraction excise tax, as outlined in SB 125, was a good step in the right direction. This landmark legislation, passed in 2022, was the result of grassroots labor and community organizing. **Unfortunately, Imperial County's funding plan for distributing the tax significantly reduced the amount that was supposed to be reserved for directly affected communities.** This created new barriers that require additional support to overcome. In settlement negotiations, CCV and Earthworks are asking CTR for reasonable environmental mitigation measures, project impact fees, and a community advisory committee (CAC) to be convened under the auspices of a joint power authority (JPA) made up of impacted communities to administer mitigation funds.

What is CCV and Earthworks Proposing as a Solution?

CCV and Earthworks are asking CTR to pay a Community Environmental Impact Fee (CEIF) tied to its annual water consumption. The CEIF will fund environmental mitigation measures to benefit the directly affected communities of Bombay Beach, Brawley, Calipatria, Niland, and Westmorland. Funds would be collected by a new JPA made up of those directly affected communities with funding recommendations stemming from a CAC established under the JPA. The CAC would be composed of local leaders and community stakeholders that are independent of industry to make recommendations on mitigation programs and funding. Funded projects could include improving water access, water conservation, mitigation of air emissions, protecting tribal cultural resources, or other environmental projects identified by the community.

Funding would not begin until the first year of lithium extraction, and no direct payments would go to CCV or Earthworks. Funding would have reasonable caps, making it a small percentage of CTR's anticipated gross annual revenue.

Protection for Tribal Cultural Resources

CCV and Earthworks are asking CTR to fund a cultural resource assessment and hire tribal monitors during construction of its Project to ensure that impacts to tribal cultural resources are avoided during construction. The Hell's Kitchen Project is located within the boundary of the Southeast Lake Cahuilla Active Volcanic Cultural District (SELCAVCD), a sacred cultural landscape to multiple California Indian Tribes. Tribal nations that have voiced concerns on lithium development in the area include: the Fort Yuma Quechan Indian Tribe, Kwaaymii Laguna Band of Indians, Agua Caliente Band of Cahuilla Indians, Jamul Indian Village, Manzanita Band of the Kumeyaay Nation, Morongo Band of Mission Indians, Twenty-Nine Palms Band of Mission Indians, and the Viejas Band of Kumeyaay Indians. Planning for tribal monitoring and robust tribal cultural resources assessment should have been done as part of the EIR.

Sustainability

CCV and Earthworks are asking that CTR make the EIR's vague promises a reality, by designing the project in line with the highest standards for environmental sustainability, including:

- Commit to conserving 50-80% of water using methods that CTR and other companies have already proposed, such as reusing steam condensate.
- Achieve LEED certification and/or meet CalGreen Tier 1 or 2 building standards.
- Install solar panels on building rooftops and parking areas.
- Commit to using zero-emission vehicles, as promised in the EIR, with charging infrastructure on-site.

Information Sharing

We are asking CTR to be transparent and provide reasonable notice of required public permitting, monitoring, and reporting during construction and operation through regular meetings. We are not asking for any proprietary or sensitive information.

Waste Reduction

CCV and Earthworks are asking CTR to provide a waste reduction study within one year of lithium production. This study will help assess ways to divert hazardous and nonhazardous waste from landfills, including the feasibility of selling non-lithium byproducts (as promised in the EIR). Again, no proprietary information is being requested, merely that CTR provides basic information about this novel industry.

Next Steps

CCV and Earthworks' case is in the Court of Appeal with briefing scheduled in Fall 2025, and confident it will ultimately prevail. In the meantime, CCV and Earthworks have been open to reaching amicable solutions with CTR and Imperial County. We have been consistently open and willing to discuss a settlement that includes implementing these reasonable environmental mitigation measures, rather than continue fighting in court. These measures may also provide a useful framework of best practices for the Lithium Valley Specific Plan (LVSP) and Programmatic Environmental Impact Report (PEIR) to shape a future of more equitable and sustainable lithium development in Imperial County.

Want to learn more?

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NOTES ON TERMINOLOGY

Acre-Feet per Year (AFY): A common accounting measure of annual water supply represented by the amount of water it takes to cover an acre of land one foot deep.

Community Air Protection Program (CAPP): CAPP was established by Assembly Bill (AB) 617 (C. Garcia, Chapter 136, Statutes of 2017) to reduce local air pollution and improve public health in the most polluted and vulnerable communities in California. The goal of this program is to provide funding for communities to develop a community air monitoring plan or a community emission reduction program.

California Air Resources Board (CARB): CARB is a state agency responsible for protecting the public from the harmful effects of air pollution and developing programs and actions to fight climate change. They do this by gathering air quality data, ensuring quality of the data, designing and implementing air models, and setting ambient air quality standards for the state.

California Environmental Quality Act (CEQA): CEQA is a state law enacted in 1970 that requires state and local agencies to assess the environmental impacts of proposed development projects, aiming to disclose and mitigate environmental impacts.

Comite Civico del Valle (CCV): 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 their organization. CCV is a 501(c)(3) organization with an extensive background and accomplishments that date back to their grassroots origins in 1987. Their 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.

Community Advisory Committee (CAC): A CAC is an advisory body that may include local residents, community-based groups, tribal nations, public health experts, environmental scientists, existing regulatory bodies, and other stakeholders. It makes recommendations of public benefits that are a priority to the community. A CAC may also make recommendations on cost-effective measures to enhance public disclosure of industrial activities, as well as feasible project design features and other strategies to address potential impacts. It serves as a public forum to address emerging issues affecting nearby communities.

Community Environmental Impact Fees (CEIF): CEIF are intended to mitigate the impacts of new development on people, public services, and infrastructure, that are associated with roads, schools, parks, and industrial facility construction. CEIFs ensure that new development contributes its fair share toward the costs of expanding or improving these facilities to meet the increased demand generated by the new development or to mitigate the adverse impacts of these projects on people and place. CEIFs are authorized under California Government Code Section 66000, known as the "Mitigation Fee Act."

Controlled Thermal Resources, Inc. (CTR): CTR is a company specializing in renewable energy, lithium, critical minerals, and battery material products, with its Hell's Kitchen Project under development. The company, which redomiciled to the United States in 2022, was established in

2012 and has headquarters in Imperial County, California, USA. Additional offices are located in Brisbane, Australia, and in Houston, Texas.

Direct Lithium Extraction (DLE): DLE differs from conventional lithium mining methods like brine evaporation or open-pit mining. DLE is an umbrella term that may include various chemical techniques, including: adsorption, ion exchange, solvent extraction, membranes, or other electrochemical processes. DLE is not yet proven to be commercially viable at an industrial scale on its own, and its environmental impacts on climate, air and freshwater use may still be significant.

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. They work with communities and grassroots groups to reform government policies, improve corporate practices, influence investment decisions, and encourage responsible materials sourcing and consumption. They expose and aim to prevent the health, environmental, economic, social, and cultural impacts of mining and energy extraction through work informed by sound science.

Electric Vehicles (EVs): EVs have been marketed as an alternative to internal combustion engine vehicles to reduce carbon emissions. They are powered by batteries that require minerals, such as lithium, cobalt, nickel, copper, manganese, graphite and rare earths. In California, new vehicles are required to reach 100% zero-emission and clean plug-in hybrid-electric by 2035, according to the Advanced Clean Cars II regulations adopted in 2022.

Environmental Impact Report (EIR): An EIR is a document that analyzes and discloses a project's potential effects on the natural and human environment. It is required under CEQA and serves to inform the public and decision-makers about the environmental consequences of proposed projects.

Environmental Justice (EJ) Communities: These are neighborhoods most burdened and harmed by many cumulative sources of pollution and injustices, and are often working-class people of color. On a state policy level, they are referred to as Disadvantaged Communities (DACs) - the most burdened census tracts identified by CalEnviroScreen2 using over 20 indicators of environmental health and socio-economic burdens.

Environmental Protection Agency (EPA): EPA is a federal agency that protects people and the environment from health risks, sponsors and conducts research, and develops and enforces environmental regulations.

Free, prior, and informed consent (FPIC): FPIC is a principle recognized in the United Nations' Declaration on the Rights of Indigenous Peoples designed to ensure the engagement and incorporation of Indigenous Peoples in decision-making based on their rights to land, territory and resources. FPIC is an ongoing process that 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.

Geothermal Brine: Geothermal brine is made up of mineralized or saline groundwater with a high concentration of total dissolved solids (TDS). It is located in areas with geothermal activity and reaches high temperatures that allow it to generate steam for electricity when brought to the surface. Some geothermal brine deposits, such as the Salton Sea Known Geothermal Resource Area, contain lithium. Lithium is also found in continental brines in Chile, Argentina and Bolivia, as well as oilfield brines in Arkansas and Texas. Lithium may also be mined from hard rock pegmatites and sedimentary clay deposits.

Imperial Irrigation District (IID): IID is a public service agency located in Imperial County, California established in 1911 under the California Irrigation District Act. It is the largest irrigation district in the United States, providing irrigation water and electricity to the Imperial Valley and parts of Coachella Valley. IID is vital for the agricultural economy of the region, where 98% of the water it transports is used for farming, serving approximately 500,000 acres of farmland with water from the Colorado River.

Joint Power Authority (JPA): A legal entity created when two or more public agencies agree to jointly exercise powers they already possess. These agencies can be at the federal, state, county, special district, or school district level, and can also include tribal governments or, in some cases, non-governmental entities. JPAs are formed to address common problems, pool resources for projects, or act as a single representative body for specific activities. JPAs are governed by the Joint Exercise of Powers Act (California Government Code Section 6500 et seq.).

Southeast Lake Cahuilla Active Volcanic Cultural District (SELCAVCD): SELCAVCD is a tribal cultural resource and cultural landscape that encompasses an array of active volcanic phenomena that surround the geothermal lithium resource at the Salton Sea. It is a corridor connecting prominent features, including mud pots, mud volcanoes and steam vents that are visible from the shared viewscape of sacred mountains and five rhyolite domes known as the Salton Buttes.

INTRODUCTION

Lithium plays a key role in meeting climate goals, as an ingredient of batteries that power electric vehicles (EVs) and energy grid storage. Yet, despite its importance for decarbonization, environmental justice (EJ) community members, tribal nations and advocates have voiced heightened concerns about adverse social and ecological impacts of lithium extraction. This report offers an overview of the environmental health impacts of lithium extraction from geothermal brine and provides recommendations to mitigate the harms and maximize benefits for affected communities and tribes. It centers on a case study that raises serious concerns: the Hell's Kitchen Lithium and Power Project proposed by Controlled Thermal Resources (CTR) in Imperial Valley, California.

Lithium extraction has had well-documented impacts on local communities and ecosystems. Open-pit lithium mining produces vast quantities of tailings with serious impacts on groundwater in Australia, and lithium brine evaporation has exhausted aquifers in Chile and Argentina.[1] Novel technologies, collectively referred to as direct lithium extraction (DLE), have been framed as a green solution to these problems, but cutting edge research shows that the water footprint, as well as climate and air quality impacts, are still significant.[2]

On August 30, 2023, Imperial County released its environmental impact report (EIR) for the Hell's Kitchen Project with comment due on October 23, 2023. In response, CCV and Earthworks submitted over 100 pages of expert comments. Weeks later, the County released the Final EIR, which was approved by the County's Planning Commission on December 13, 2023. Shortly after receiving its Planning Commission approval, CTR announced its plan that the Hell's Kitchen Project was but stage 1 of its conceptual 7-stage plan for geothermal DLE development in the area. Similarly, in December 2023, Imperial County announced its Notice of Preparation and Initial Study of its programmatic EIR for the draft Lithium Valley Specific Plan, which estimated water demand at 100,000 AF for the first phase of specific plan development.[3] None of this was disclosed or considered in the Hell's Kitchen EIR, even though the Lithium Valley Specific Plan was the County's own project. This has since been adjusted to a total water demand of 77,776 acre-feet per year (AFY), according to the draft Lithium Valley Specific Plan released in February 2025. This includes 48,023 AFY for Phase 1, 15,220 AFY for Phase 2, and 14,533 AFY for Phase 3.[4] CCV timely appealed the Planning Commission approval in December 2023, which the Imperial County Board of Supervisors dismissed. On January 23, 2024, the Imperial County Board of Supervisors approved CTR's Hell's Kitchen DLE Project located on a deposit of geothermal brine that lies deep beneath California's largest lake, the Salton Sea (Ancient Lake Cahuilla) (Figure 1).

However, in March 2024, Comite Civico del Valle (CCV) and Earthworks filed a lawsuit (also called a petition) against Imperial County's approval of CTR's EIR on grounds that it violated the California Environmental Quality Act (CEQA). The lawsuit alleges that the EIR omitted crucial details and failed to adequately analyze and mitigate impacts on water supply, air quality, and hazardous waste. The petition also argued that the Hell's Kitchen Project had not adequately complied with legally-required tribal consultation with affected tribes.[5]

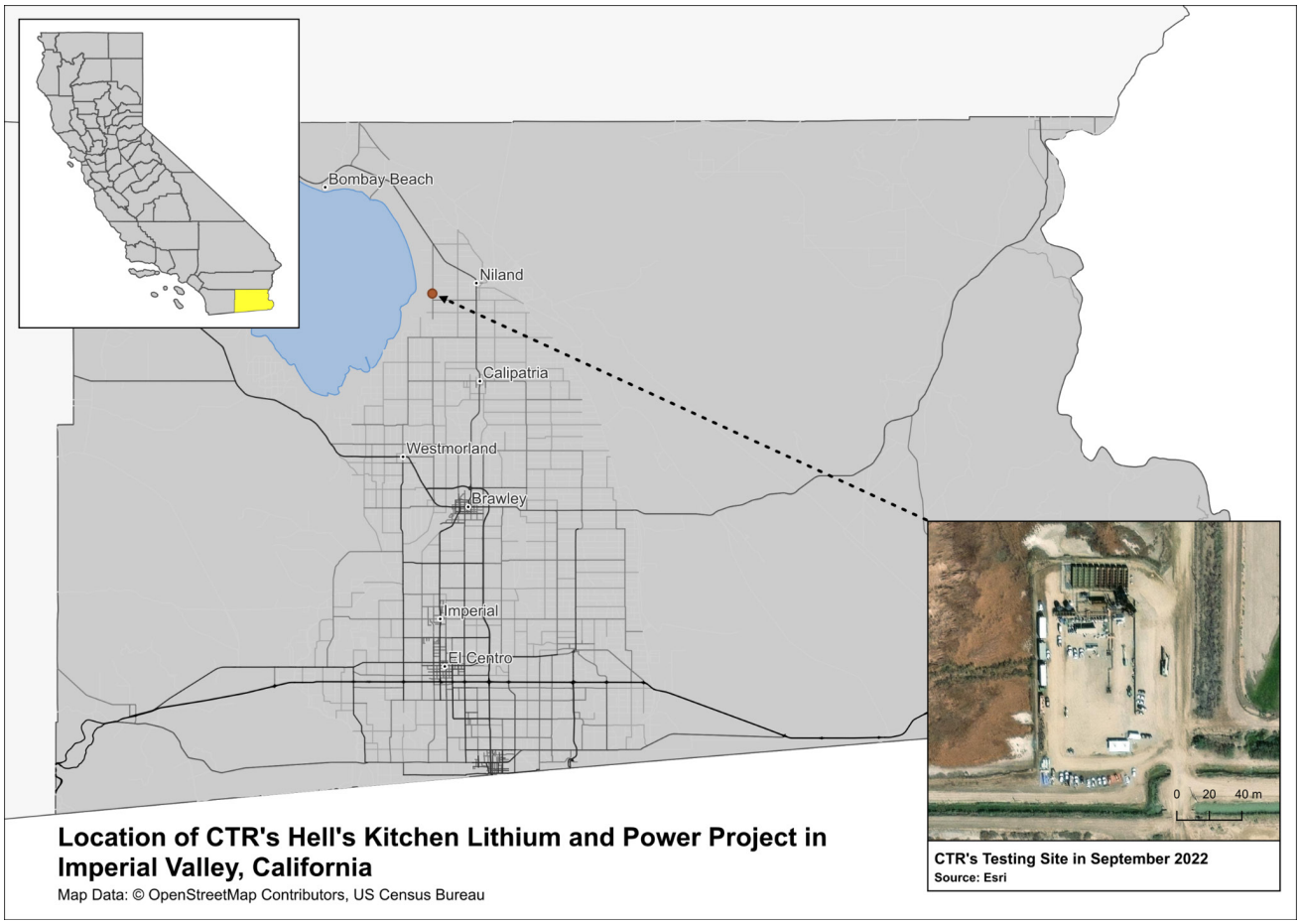


Figure 1. Location of the Hell's Kitchen Lithium and Power Project under development by Controlled Thermal Resources in Imperial Valley, California.

In a separate case involving CTR, in October 2024, the U.S. Environmental Protection Agency (EPA) announced a settlement acknowledging that CTR had destroyed about 1,200 acres of wetlands, by illegally dredging and ditching to extend Imperial Irrigation District (IID) channels, which discharged materials and allowed water from the wetlands to drain into the Salton Sea.[6] After that acknowledgment of illegal ditching and dredging, the wetlands around Hell's Kitchen caught on fire in November 2024, though the cause of the fire is unknown.

Despite this alarming series of events, **CCV and Earthworks have consistently stressed no opposition to lithium development in principle, as long as there are reasonable environmental mitigations and public health protections for affected communities and tribes.** The use of DLE on geothermal brine is not yet proven on an industrial scale. If feasible, it might help to avoid some harmful impacts of open-pit mining or evaporation ponds while pairing mineral extraction with renewable energy production. Recently, it has been estimated that the Salton Sea Known Geothermal Resource Area in Imperial Valley may contain up to 18 million metric tons of lithium that can be extracted.[7] In 2020, Assembly Bill (AB) 1657 created the Blue Ribbon Commission on Lithium Extraction in California, which set out to transform Imperial Valley into "Lithium Valley."[8]

In what follows, we consider both the promises and the perils of the vision for Lithium Valley, with a particular focus on the public health impacts of, and potential mitigation measures for, CTR's Hell's Kitchen Project.

LITHIUM VALLEY: CLEAN ENERGY HUB OR GREEN SACRIFICE ZONE?

Assembling a new Lithium Valley battery supply chain in Imperial Valley–home to some of the most economically disadvantaged EJ communities in California–may seem to some like a win-win scenario for "green justice."[9]. Yet, without a robust mitigation and policy framework to improve environmental health and ensure community benefits, geothermal lithium development risks transforming Imperial Valley into a green sacrifice zone.[10] To truly benefit Imperial Valley's resilient communities of farmworkers, tribal nations and local residents, we need to take seriously the public health impacts of industrial developments like CTR's Hell's Kitchen Project and implement practices and policies that will deliver a safe and healthy environment for Imperial Valley families.

Unfortunately, geothermal DLE is no silver bullet for sustainability. Despite the hype, recent studies have found that DLE can lead to at least double if not ten times more freshwater use, and seven-fold higher climate impacts, than conventional lithium mining.[11] Imperial County's vision for Lithium Valley would bring all manner of industrial activities that significantly decrease water availability and increase local pollution. CTR's highly flawed EIR for Hell's Kitchen failed to seriously address these problems, leading to litigation by CCV and Earthworks.

Water Supply Concerns

Even though large evaporation ponds may not be necessary in geothermal DLE, the process adds compounding stressors on the local water supply. Water is required in DLE to strip lithium ions from sorbents, wash off acid, and regenerate resin. Pairing DLE with geothermal operations would necessitate even more water for cooling towers and brine dilution. If more water is used for new industrial development projects like Hell's Kitchen in Imperial Valley, then less water would reach the Salton Sea. This lake is located in a closed basin that does not drain to the ocean. It has been replenished historically from Colorado River water through agricultural runoff and is already rapidly receding due to water diversions to cities like San Diego and Los Angeles. The playa on the exposed shoreline at the Salton Sea is polluting local communities with dust and toxic spray from the lake that has long been contaminated by pesticides, herbicides, fertilizers, sewage and wastewater.[12] Increasing salinity and bacteria levels have led to algal blooms, fish die-offs and avian diseases.[13] Water conservation has also become a serious regional concern amid efforts to sustain the Colorado River that has entered a prolonged drought.

Despite these highly complex stressors on the local water supply, CTR's EIR did not adequately address how increased industrial water consumption could speed up the drying of the Salton Sea. The approved EIR only assessed stage one of CTR's concept of a 7-stage lithium hub at Hell's Kitchen, and just the intial project (i.e., stage 1) would require 6,500 acre-feet per year (AFY) of freshwater. Nor did the EIR consider three major geothermal developments also seeking to use substantial amounts of industrial use water from IID, even though numerous experts, academics, and IID commented that the EIR should have considered these known projects. Instead of analyzing these cumulative projects, the EIR stated these projects were irrelevant because they were 1 mile

away and gave a blanket statement that CTR would "work with IID" to manage reductions in water availability, but the IID did not consider this an acceptable mitigation.[14] In comments released on the final EIR, the IID pointed out that CTR had not adequately assessed impacts to water quantity, failing to consider impacts and possible mitigations for increased salinity and degraded water quality at the Salton Sea due to decreased drainage flows. The IID stressed that CTR must identify specific measures to mitigate water supply reductions amid drought on the Colorado River. The day before the County Board approved the Project, the EIR was slightly modified to provide operational changes "may" be implemented under unpredictable conditions, such as producing groundwater, temporary use of recycled drain water, and/or reducing production rates. These 11th hour modifications, however, are contradicted by CTR's own EIR that claims no groundwater or drain water would be used, and that their engineers have not been able to identify a feasible way to scale down the project. The litigation brought by CCV and Earthworks challenges these ad-hoc illusory measures (which are self-contradictory and unenforceable) and has provided apt opportunity for CTR to agree to reasonable mitigation measures, such as those outlined below.

Air Quality Standards

Projects like Hell's Kitchen have a potentially significant impact on air quality for communities around the Salton Sea that are already overburdened with pollution. Hastening the Salton Sea's degradation would lead to further dust pollution. Salton Sea pollution, combined with heavy agriculture and border traffic, have severely impacted North End communities, putting Brawley, Westmorland, and Calipatria, at the 99th percentile for asthma and the 92nd percentile for cardiovascular disease, according to CalEnviroScreen. CTR's Hell's Kitchen Project would also bring direct emissions of particulate matter, greenhouse gases, hydrogen chloride, as well as potentially toxic or bothersome non-condensable gases like hydrogen sulfide–concentrations of which already exceed California's air quality standards near the Salton Sea.[15]

Unfortunately, CTR's EIR gave contradictory information about compliance with air quality plans. It failed to mitigate ozone, PM2.5 and PM10, for which the area is already in serious non-attainment. There was no analysis of vapor emissions from hydrochloric acid (HCl), air pollution from brine ponds, or air quality impacts from worsening degradation of the Salton Sea. Rather than considering alternative mitigation measures in a health risk assessment, such as changes to operations for onsite reductions, the EIR relied on mitigation offset fees for nitrogen oxides (NOx) and other emissions that were expected to exceed legal thresholds. It made unsubstantiated claims about "proven abatement systems" to control hydrogen sulfide.[16] Inadequate air quality and emissions details are especially concerning in an area that has already been designated for reduced exposure to air pollution through the California Air Resources Board (CARB) Community Air Protection Program (CAPP).[17]

CTR's EIR claimed to use electric trucks for shipping, but there were no clear plans for assembling fleets or heavy duty vehicle charging infrastructure. The EIR proposed using Tier 3 engines or better during construction when commercially feasible, but there was no explanation why Tier 4 final engines would not be appropriate or how feasibility would be determined. Daily truck trips were not consistently analyzed, and the use of heavy-duty diesel equipment was not fully considered because it was assumed that trucks would be electric without evidence.

Finally, it is remarkable that the EIR did not include a commute trip reduction or rideshare program to mitigate air pollution because the proposed Project was "not considered a major employment center."[18] CTR representatives have frequently advertised job estimates of 4,000+ locally hired workers in public presentations, appealing to residents of Imperial Valley, where there are high rates of unemployment.[19] Yet, the Hell's Kitchen EIR only lists 112 jobs (22 jobs at the geothermal power plant and 90 jobs at the lithium facility).[20] It seems that CTR has tried to cherry-pick exaggerated numbers for jobs that correspond to their broader multi-staged development plan–including many indirect ancillary businesses–while downplaying cumulative impacts by focusing only on stage 1 of Hell's Kitchen in the EIR. Conveniently, stage 1 is designed to produce 49.9 megawatts (MW), and if it were to produce 50 MW or more, it would need to go through a potentially more rigorous assessment by California Energy Commission staff, instead of being hastily approved after minimal response to EIR comments that included numerous critical comments submitted by experts, academics, and public agencies with expertise in their respective fields. This raises concerns about possible piecemealing to avoid accountability for the full extent of Hell's Kitchen's anticipated environmental impacts.

Hazardous Waste: The Lithium Loophole

CTR has framed geothermal lithium production as a closed-loop process, but this is really a convenient loophole, which omits significant hazardous waste streams that must be mitigated. Geothermal power production involves bringing hot brine to the surface from far beneath the earth and then reinjecting it into the same underground deposit after flashing steam to produce electricity. Developers like CTR now propose to add DLE to that same geothermal process by obtaining lithium from the brine before it is reinjected, through undisclosed DLE technologies, which might include adsorption, ion exchange, solvent extraction, membranes, or other electrochemical processes. While waste may be reduced through brine re-injection, non-lithium byproducts must be managed, such as potential solid waste that may contain hazardous elements.

CTR's EIR states that there will be less than significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials and as a result no

mitigation is required. CTR has even gone as far as to claim that "the mineral extraction process would not generate any waste but result in biproducts [sic] which will be sold."[21] This downplays considerable quantities of expected solid waste, including iron silicate filter cake, as well as sludge scaling and metal solids deriving from brine ponds that are often considered hazardous based on California's Soluble Threshold Limit Concentration, due to significant leachable levels of lead and arsenic. Studies show that DLE paired with geothermal energy can produce significantly more solid waste than geothermal power production on its own due to additional steps required for brine pre-treatment and lithium post-treatment.[22] Yet, the Hell's Kitchen EIR provided no evidence to show commercial feasibility of producing silica, "polymetallic products" (e.g. zinc and manganese), or boron compounds for sale without sending any low-value materials to landfills, as CTR promised.[23] Moreover, there was no meaningful analysis for substantial risks from spills of arsenic and lead-containing materials from blowouts, corrosion, abrasion, accidents, and scaling (deferring analysis to future regulatory oversight to be determined). Community members have expressed concerns about induced seismicity and subsidence as a result of drilling and brine reinjection. Geothermal operations in the area have led to pollution from brine spills and require careful handling, storage and disposal of solid waste.

Lack of Meaningful Consultation and Protection of Tribal Cultural Resources

The UN Declaration on the Rights of Indigenous Peoples enshrined Indigenous Peoples' right to Free, Prior, and Informed Consent (FPIC) on projects affecting their lands, territories, resources, and cultural heritage.[24] California law requires public agencies to consult with California Indian Tribes during the CEQA process under AB 52. There are deep concerns about whether Imperial County obtained FPIC, provided meaningful AB 52 tribal consultation, or gave good-faith responses to CEQA comments on tribal impacts before approving the Hell's Kitchen EIR. Representatives of The Agua Caliente Band of Cahuilla Indians, The Fort Yuma Quechan Indian Tribe and The Kwaaymii Laguna Band of Indians have stated that AB 52 tribal consultation for Hell's Kitchen was inadequate, and they have concerns about impacts to tribal cultural resources and sacred sites.[25] It was especially telling that undeleted comments from authors of the Hell's Kitchen draft EIR acknowledged that "based on the consultation summary, Quechan did not want us to be involved."[26]

Tribes that have generally raised concerns about the impacts of the Hell's Kitchen Project and other Lithium Valley Projects include the Fort Yuma Quechan Indian Tribe, Kwaaymii Laguna

Band of Indians, Agua Caliente Band of Cahuilla Indians, Jamul Indian Village, Manzanita Band of the Kumeyaay Nation, Morongo Band of Mission Indians, Twenty-Nine Palms Band of Mission Indians, and the Viejas Band of Kumeyaay Indians.[27]

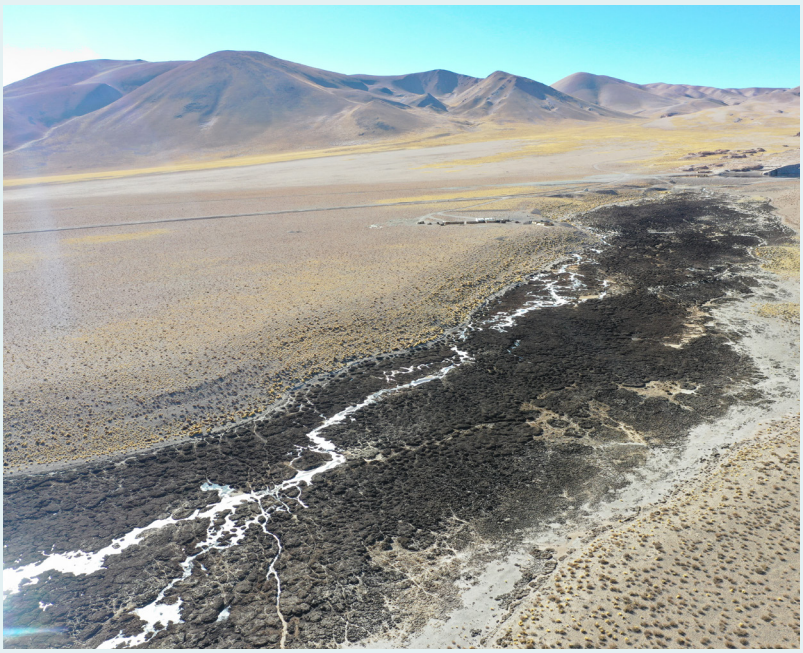
The Hell's Kitchen Project is located within the Southeast Lake Cahuilla Active Volcanic Cultural District (SELCAVCD), which has been thoroughly documented by tribal monitors, cultural resource managers, and archaeologists.[28] Carmen Lucas, a tribal monitor, expert, and elder of the Kwaaymii Laguna Band of Indians has consistently pointed out that the geothermal lithium resource at Hell's Kitchen is part of a broader array of active volcanic phenomena in the same cultural landscape.[29] Yet, the EIR did not adequately consider project impacts and cumulative impacts on this tribal cultural landscape that includes nearby sacred sites, including mud pots, mud volcanoes and the Salton Buttes. One of these lava domes, Obsidian Butte, is Southern California's only source of the black volcanic rock, which has been used since time immemorial as a tool and luxury item by California Indian peoples.[30] Lucas and others have expressed in extensive public comments the need for reasonable protections to control access and place this tribal cultural resource on the State and National Registers of Historic Places. CEQA guidelines indicate that even if a site is not listed, this does not mean it is not significant for CEQA purposes. The EIR's determination that "there are no known tribal cultural resources within the Project site" thus failed to recognize potentially significant impacts on the surrounding viewshed and cultural landscape.[31] Nor did the EIR or County require any tribal-specific monitors during earth-moving activities, which is a common mitigation measure routinely used for other projects.

Urgent Need for Cumulative Impact Assessment

While geothermal lithium development may promise green jobs and economic development, the environmental and public health costs need to be accounted for, especially in disadvantaged communities. To minimize further environmental burdens, it is critical to carefully assess and mitigate all reasonably foreseeable cumulative impacts of geothermal lithium development related to water consumption, air quality, hazardous waste, and tribal cultural resources. Cumulative impact assessment is especially crucial in an arid desert that already has high rates of pollution and extreme heat.[32]

CAUTIONARY TALE: DLE has already depleted rivers and wetlands in arid Argentina

There is a clear international precedent for requiring cumulative impact assessment based on a precautionary principle to address the environmental impacts of DLE in arid areas. The Fénix lithium mine, operated by Minera del Altiplano and recently acquired by Rio Tinto at the Hombre Muerto salt flat in the Argentine province of Catamarca, is one of the world's only industrial operations where DLE has already been used at some stages of production.[33] This project's freshwater extraction for selective adsorption of lithium has resulted in depletion of the Trapiche River, drying up seven km2 of the adjacent meadow and displacing Indigenous families.[34] In March 2024, the Catamarca Court of Justice ruled in favor of the Atacameños del Altiplano Indigenous Community, halting permits for further expansion and exploitation in the broader Los Patos River basin until cumulative impacts are assessed.[35] This has also led to multiple class action lawsuits filed on behalf of former shareholders, arguing that Arcadium, the predecessor to Rio Tinto, had failed to disclose these risks and the investment had lost value amid multiple mergers and acquisitions.[36]



The EIR for Hell's Kitchen failed to address reasonably foreseeable cumulative impacts. It used a very short list of related projects that excluded several existing and planned solar and geothermal energy projects, which agencies like the U.S. Fish and Wildlife Service, IID and others found inadequate to assess cumulative impacts.[37] The EIR ignored the County's well-publicized vision for significant industrial development in Lithium Valley, and it did not consider impact scenarios that incorporate existing environmental mitigation requirements for water transfer and conservation agreements or Salton Sea restoration projects, such as the Salton Sea Air Quality Mitigation Program, the Salton Sea Management Program 10-Year Plan or the Salton Sea Management Program Long Range Plan. Again, the EIR did not consider the County's own Lithium Valley Specific Plan or CTR's own foreseeable 7-stage campus project. Conveniently, the County's Notice of Preparation for the Specific Plan was released around the same time it released the Final EIR for the Hell's Kitchen Project. It was also convenient that the 7-stage plan was not announced until shortly after CTR received its Planning Commission approvals despite CTR's repeated references to multi-stage development.[38] Collectively, these flaws fell short of compliance with CEQA, which requires cumulative impact analysis of foreseeable developments.

Given the existing air quality problems affecting communities in the North End of the Imperial Valley designated under CARB's AB 617 program, a thorough environmental review process must include a cumulative impact air quality analysis, along with project-specific mitigation measures, impact fees, enforceable conditions of approval, and transparent oversight to enable the public to meaningfully engage with the County and regulators to address emerging issues and best practices for this novel industry. These concerns are amplified where there is significant overlap between AB 617 communities and the project site.

These shortcomings are especially concerning because the EIR failed to consider feasible project alternatives or disclose important information. CTR's EIR refused to consider any project alternatives to reduce environmental impacts. The EIR failed to consider more protective thresholds or enforceable mitigations, or consider alternatives that might minimize cumulative impacts and address unknowns about this novel industry. By the same token, the EIR was not transparent about crucial details regarding planned and completed development activities. In comments on the final EIR, the California State Lands Commission noted that CTR did not disclose pertinent drilling plans. The California Department of Fish and Wildlife and IID both expressed serious concerns about how CTR had already dewatered without permits.[39] Given these comments, it was no surprise that the subsequent EPA settlement acknowledged illegal ditching and dredging by CTR that resulted in material discharge and release of water from 1,200 acres of wetlands.[40]

EXISTING BARRIERS TO SUPPORTING DIRECTLY AFFECTED COMMUNITIES IN IMPERIAL VALLEY

Despite these serious concerns, CCV and Earthworks have always made it clear that we are not opposed to lithium development, as long as reasonable environmental mitigations and public health protections are in place alongside enforceable Community Environmental Impact Fees (CEIF). In 2022, labor and community organizers campaigned successfully for landmark tax legislation of Senate Bill (SB) 125 – Lithium Extraction Excise Tax. The tax–which CTR vehemently opposed–is volumetric, i.e. based on how many metric tons of lithium carbonate equivalent are produced.[41] Twenty percent of tax revenue is supposed to go to the Salton Sea Restoration Fund managed by the California Natural Resources Agency, and the other 80 percent of revenue will go to Imperial County. Of that 80 percent, the County must distribute not less than 30 percent of the funds to Imperial County communities that are most directly and indirectly impacted by the lithium extraction activities. This lithium extraction excise tax, as outlined in SB 125, was a good first step.

However, Imperial County's Lithium Excise Tax Funding Plan left directly affected communities in the dust. The original bill had reserved the full 30 percent for the directly affected communities, but the County's distribution plan opened it up to a much wider area. The County Board of Supervisors hastily approved the funding plan in September 2024 with very little community engagement. The funding plan left only 15 percent of the revenue for directly affected communities. The County plans to use 60 percent of funds received to fill its own program coffers rather than direct it toward the most affected communities (Figure 2).[42]

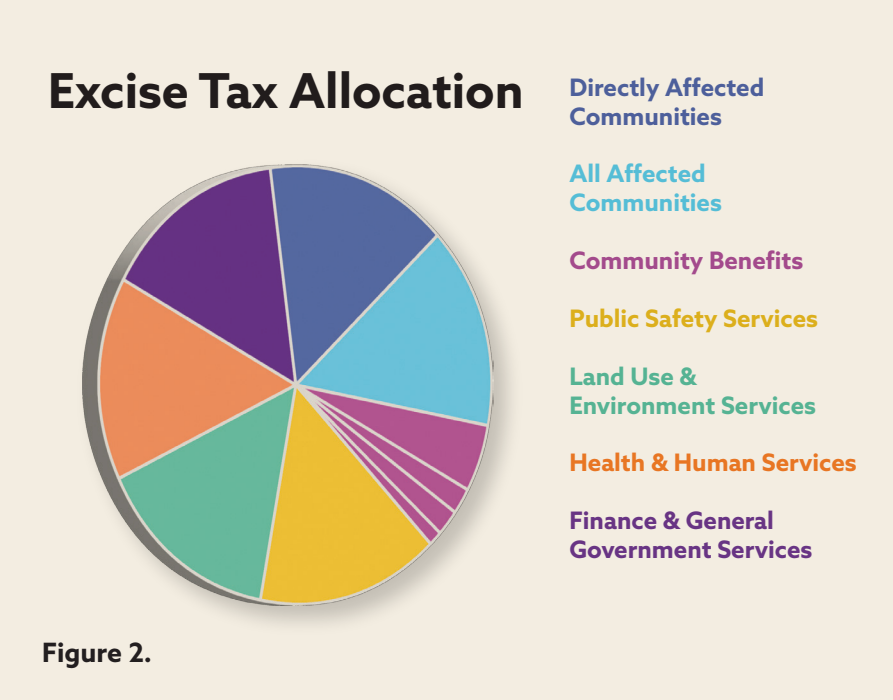


Figure 2.

The County's tax funding plan presented new barriers to supporting directly affected communities because it is based on population rather than environmental impacts or community needs. The funding plan uses population as the only determinant for distribution rather than other important considerations, such as proximity to development. Bombay Beach–a directly affected community in close proximity to pollution burdens from proposed lithium development–would receive no location priority bonus. Using a revenue example provided by the County, Bombay Beach would receive just $4,935.46 out of the allocation to directly affected communities and $3,735.10 out of the allocation to all-affected-communities, for a total of $8,631.10 if the County receives $6,400,000 in a given year.[43] More populous locations that

are farther away from development would receive much more funding, for example: El Centro ($239,477.85), Calexico ($209,060.29), or Imperial ($110,840.83).[44]

The County's tax funding plan also failed to address direct impacts on tribes. The funding plan designates tribes as "indirectly affected communities," ignoring direct impacts on tribal cultural resources.[45] The Kwaaymii Laguna Band of Indians and associates have already documented significant impacts to tribal cultural resources in the SELCAVCD that require assessment, protection and consultation with a tribal monitor.[46] The use of "allocated tribal and cultural affairs funding" owed to tribes within the Lithium Community Benefits Program should be tribally driven, not determined by the County as part of the overall funding plan.[47]

Combining Taxes with Community Environmental Impact Fees (CEIF) May Help Overcome Barriers

Lithium mining is a volatile industry subject to boom and bust cycles that brings significant risk and liability to directly affected communities. It is an established best practice to diversify public revenue from mineral resource production by combining taxes with CEIF fees, royalties and other direct payments.[48]

For example, the Raglan Agreement, signed in 1995 by five different Inuit Nations and the Raglan nickel mine currently operated by Glencore in the Nunavik region of Quebec, Canada provides single and multiple fixed payments that increase over the life of the project, as well as a 4.5 percent annual share of profit.[49]

In the United States, traffic impact fees have been used to fund multi-year capital improvements to community infrastructure like parks, sidewalks, and increased public transportation services. With respect to water, Imperial County could require a water impact fee tied to a project's annual water usage, which could be limited to fund not only infrastructure, but also mitigation programs. Such mitigation programs could fund community and environmental projects identified as a priority by a Community Advisory Committee (CAC), established by a Joint Power Authority (JPA) of impacted communities, including local residents, community-based groups, tribal nations, public health experts, environmental scientists, existing regulatory bodies, and other stakeholders.

CCV believes that these types of impact fee policies should be used to foster the sustainable development of the lithium industry in the Imperial Valley and to establish a model for overcoming barriers to supporting directly affected communities more broadly. In settlement proposals, CCV has consistently proposed impact fees tied to CTR's project water usage, such as a modest annual water impact fee (CEIF) to be administered by a JPA, advised by a CAC, and subject to the same verifications and oversight as the Lithium Extraction Excise Tax. This offers a vision of what community centered geothermal lithium development might look like at Hell's Kitchen.

Need for Joint Power Authority (JPA) and Community Advisory Committee (CAC)

"Joint powers" is a term used to describe government agencies that have agreed to combine their powers and resources to work on common issues. JPAs offer another way for governments to deliver services and are exercised when two or more agencies agree to create another legal entity, or establish a joint approach to fund a project, or act as a representative body for a specific activity. Government agencies that can exercise joint powers include federal agencies, state departments, counties, cities, special districts, and school districts.

There are no official categories for the types of JPAs, but their services fall into five broad groups: public services, financial services, insurance pooling and purchasing discounts, planning services, and regulatory enforcement. Examples of areas where JPAs are used commonly include: environmental mitigation, groundwater management, road construction, habitat conservation, airport expansion, stadium construction, mental health facility construction, educational programs, employee benefits services, insurance coverage, and regional transportation projects.

CCV and Earthworks are proposing that Imperial County authorize the establishment of a JPA to administer the distribution of CEIF funds and to develop a portfolio of environmental and public health mitigation programs aimed at alleviating the industrial impacts of CTR's Hell's Kitchen Project on neighboring communities and residents. **No direct payments would go to CCV or Earthworks.** SB 125 defines the communities of Bombay Beach, Brawley, Calipatria, Niland, and Westmorland as directly affected by lithium extraction and should be considered the anchor members of this newly created JPA.

CCV and Earthworks are also proposing the creation of a CAC made up of environmental justice, natural resource protection, public health, economic development, California Indian Tribes, organized labor, and local residents. The role of the CAC would be to advise the JPA on emerging issues directly affecting communities and tribes, and make recommendations regarding feasible project design features, environmental and public health mitigation programs, and impact fee fund distribution. The range of environmental mitigation and public health protection programs include:

- Water Access Improvements
- Residential Water Conservation
- Mitigating Air Pollution Emissions
- Protecting Tribal Cultural Resources
- Other resource conservation or impact mitigation (e.g., dust suppression efforts identified in plans, supplemental environmental projects, direct installation of high-efficiency appliances for low-income residents, etc.)

In California, a CAC is often appointed by a local government or agency. In this case, CCV and Earthworks propose that the newly formed JPA appoint the CAC members to ensure community input is considered in JPA environmental mitigation policies and decision-making processes. CACs provide a community perspective by representing the voices and concerns of residents, especially those disproportionately affected by environmental issues. They can advise by offering recommendations on matters related to environmental mitigation, public health protection, and environmental justice. CACs also facilitate communication and act as a bridge between the community and JPA decision-makers, ensuring information is shared and feedback is gathered. CACs have routinely been used to address community impacts for major land uses and industrial projects (e.g., universities, stadiums, landfills, etc.).

What is CCV and Earthworks proposing for a settlement agreement with CTR?

Mitigate impacts to the communities

- A Community Environmental Impact Fee (CEIF) mitigation program will be tied to water used for lithium extraction. This is important, because it serves as an **incentive to reduce the Project's water consumption, which has a direct link to community impacts** (i.e., nexus). This builds in an incentive for CTR to make reasonable investments into its Project to improve water conservation, such as using a condensate treatment system which could potentially reduce the Project's water usage by nearly half (i.e., from 6,500 AFY to 3,250 AFY).[50] The more efficient CTR can be, the less the CEIF fee.

- The CEIF would also be **in line with existing water rate schedules**. IID currently lists industrial and commercial water charges ranging between $85/AF to nearly $800/AF.[51] For example, an approximate $425/AF CEIF fee is in line with existing reasonable water fees, equates to **less than a fraction of a cent per gallon of water** (i.e., $0.0013/gallon), and represents a normal cost of doing business for prospective DLE operation.[52]

- The CEIF would also have reasonable caps at a small fraction of less than 1% of the Project's estimated annual gross revenue to account for price fluctuations. For example, CTR's stage 1 Project aims to extract 25,000 metric tons (MT) of lithium hydroxide each year,[53] which at recent rock-bottom prices (i.e., $8,300/MT),[54] would generate gross revenues of $207.5 million and where a reasonable cap (i.e., 0.5% - 1.0%) would equate to a max annual fee of roughly $1.037 – $2.075 million. However, based on reported estimates from Goldman Sachs and S&P, lithium prices are expected to recover to around $16,000/MT - $25,000/MT by 2027,[55] equating to even more gross revenues (i.e., $400 - $625 million). **A 0.5% - 1% cap ensures CEIF fees are properly calibrated so that lithium remains profitable.**

- **Funding will not begin until the start of lithium extraction operations**. This ensures that CEIFs would not be triggered until revenues are actually generated.

- Imperial County would authorize the collection of funds by a Joint Powers Authority (JPA) made up of the County **and SB 125 communities** of Bombay Beach, Brawley, Calipatria, Niland, and Westmorland with funding recommendations stemming from a Community Advisory Committee (CAC) established under the JPA. The CAC would be composed of local nonprofit organizations with established expertise in environmental justice, natural resource protection, public health, economic development, in addition to California Indian Tribes, organized labor, and local residents.

- Funds would be restricted to environmental mitigation and public health protection that will benefit directly affected communities of Bombay Beach, Brawley, Calipatria, Niland, and Westmorland with **affordable water, clean air,** and other safeguards through mitigations, including but not limited to:

1. Improving water access
2. Residential water conservation
3. Mitigating air pollution emissions
4. Protecting tribal cultural resources
5. Other resource conservation or impact mitigation (e.g., dust suppression efforts identified in plans, supplemental environmental projects, direct installation of high-efficiency appliances for low-income residents, etc.)

- Collectively, the above factors not only establish a nexus between the fee and the impacts of the DLE operation, but also the amount appears to be roughly proportionate to the impacts of the proposed Project on the community. CCV and Earthworks welcome additional suggestions from CTR and the County for even greater safeguards or precautions to promote transparency and inclusivity in the decision-making process.

Protect sacred sites

- Fund tribal cultural resource assessment in consultation of Kwaaymii Laguna Band of Indians or another local tribe.

- Hire at least one **tribal monitor** during construction.

Meet green standards

- Commit to conserving 50-80% of water using methods CTR and other companies have already proposed, such as reusing steam condensate. CTR and other DLE developers should make these promises enforceable.

- Achieve LEED certification and/or meet CalGreen Tier 1 or 2 standards.[56]

- Install solar panels on building rooftops and parking areas.

- Commit to using zero-emission vehicles, **as promised** in the EIR, with charging infrastructure on-site.

Share information

- Be **transparent** and provide reasonable notice of required public permitting, monitoring, and reporting during construction and operation.

- No need to disclose proprietary or sensitive information.

- This can be incorporated into the function of the CACs, which is a **common planning tool for large projects that pose significant ongoing concerns** (e.g., stadium projects, universities, major industrial projects, etc.).[57] CACs have proven critical to provide an open forum for communities to raise concerns, face emerging issues, and allow the imposition of best practice (e.g., Los Angeles County landfills with their own CACs).[58]

Reduce waste

- Within one year of lithium production, provide a waste reduction study to track materials and test samples.
- Assess ways to divert hazardous and nonhazardous waste from landfills, including by extracting byproducts besides lithium—e.g. silica, zinc, boron, and/or potassium—**as promised** in the EIR.

In sum, CCV has consistently advocated for sustainable and equitable lithium development in Imperial Valley. That means DLE projects should include feasible mitigation, minimize wasteful use of water resources, and commit to enforceable conditions—not vague promises. The above measures are reasonable asks from EJ communities.

CONCLUSION

To plan for the future of Imperial Valley, we must acknowledge the burdens it has historically shouldered. Given the legacy of environmental injustice across the Salton Sea region, planning for Lithium Valley must be done responsibly with the foresight to protect future generations of affected communities and tribes from the cumulative environmental impacts of increased water consumption, air pollution, hazardous waste, and potential harm to tribal cultural resources. A comprehensive and integrated approach to lithium development must also overcome existing barriers and alleviate the added stress of rising temperatures, increasing aridity, and growing precipitation variability due to climate change in order to fully prioritize environmental and public health.[59]

Hell's Kitchen is an ambitious power and lithium project, but the devil in the details of its flawed EIR may ruin its feasibility without robust mitigation measures in place. Understanding the risks and benefits of developing novel industrial projects like Hell's Kitchen is essential to craft policy solutions that have the capacity to fully support already overburdened communities. The settlement terms that CCV and Earthworks have proposed give CTR and Imperial County the chance to uphold their promise to pursue **equitable and sustainable lithium development**.

ENDNOTES

1 See: Jerez, B., Garcés, I., & Torres, R. (2021). Lithium extractivism and water injustices in the Salar de Atacama, Chile: The colonial shadow of green electromobility. *Political Geography*, 87, 102382. https://doi.org/10.1016/j.polgeo.2021.102382

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2 See: Díaz Paz, W. F., Seghezzo, L., Salas Barboza, A. G., Escosteguy, M., Arias-Alvarado, P. V., Kruse, E., Hufty, M., & Iribarnegaray, M. A. (2025). The water footprint of lithium extraction technologies: Insights from environmental impact reports in Argentina's salt flats. *Heliyon*, e42523. https://doi.org/10.1016/j.heliyon.2025.e42523

3 See: Dudek. (2023). *Initial Study: Imperial County Lithium Valley Specific Plan* (Nos. 22–0001), p. 47. https://ceqanet.lci.ca.gov/2023120104

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5 The Imperial County Superior Court issued its judgment on February 26, 2025 denying CCV and Earthworks' petition, but the co-litigants filed an appeal on Friday, March 7, 2025, in California's 4th District Court of Appeal, and the litigation is ongoing at the time of writing.

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19 See: Controlled Thermal Resources Holdings Inc. *CTR: Community and the Environment.* Retrieved August 11, 2025, from https://static1.squarespace.com/static/5bbc837993a6324308c97e9c/t/66876d52466a783f3f6e46da/1720151392424/240705_Community+QA_Website.pdf

20 In an updated brochure, CTR estimated more jobs for Stage 1 (220 jobs), but far fewer cumulative jobs across Stages 1-7 (940 jobs). However, they still advertise more than 1,000 jobs overall when considering up to ten potential stages, which might include additional battery hubs and data centers. See: Controlled Thermal Resources, Inc. (2025). *CTR: Energy + Critical Minerals Powerfully Combined.* https://static1.squarespace.com/static/5bbc837993a6324308c97e9c/t/687056a2fe37b91bce12f174/1752192682812/250711_CTR+Brochure_Website.pdf

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24 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.

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27 See: Concerns from Morongo Band of Mission Indians in County, I. (2023). "Native American Contact Program," *Draft Environmental Impact Report for the Hell's Kitchen PowerCo 1 and LithiumCo 1 Project,* p. 13. https://ceqanet.opr.ca.gov/2022030704/3

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(Note: The Hell's Kitchen EIR claimed that Agua Caliente Band of Cahuilla Indians responded that the project area was beyond their Traditional Use Area, yet here this tribe's Tribal Historic Preservation Office wrote that the neighboring Elmore North geothermal project lies within the tribe's Traditional Use Area.)

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53 See: CTR, *Lithium Valley Campus breaks ground at Hell's Kitchen*. Retrieved August 13, 2025, from https://www.cthermal.com/latest-news/lithium-valley-campus-breaks-ground-at-hells-kitchen.

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57 See: e.g., Howard Terminal Community Benefits Agreement Orientation (1/11/2020), pp. 6-9 (noting numerous stadium projects throughout the nation), from: https://cao-94612.s3.amazonaws.com/documents/Howard-Terminal-Community-Benefits-Agreement-Orientation-Materials-January-11-2020.pdf;

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See also: Redwood Coast Energy Authority Community Advisory Committee, (involving fishers and offshore wind energy projects), from: https://file.lacounty.gov/SDSInter/bos/supdocs/146322.pdf

See also: City of Long Beach, Resolution No. RES-21-0078, pp. 19-20, 260 (specific plan for the redevelopment of coastal zone subject to CEQA), from: https://documents.coastal.ca.gov/reports/2021/9/W14a/w14a-9-2021-exhibits-2.pdf

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