

Northern California Megaregion

**Zero Emission
Medium- and
Heavy-Duty
Vehicle Study**

AUGUST 2024



Acknowledgements

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GO-Biz
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Pacific Gas & Electric
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Caltrans



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Glossary

AB	Assembly Bill	IOO	Independent Owner Operator
ACE	Altamont Corridor Express	LCFS	Low Carbon Fuel Standard
ARB	Air Resources Board	kg	Kilogram
ARCHES	Alliance for Renewable Clean Hydrogen Energy Systems	KPI	Key Performance Indicator
BEV	Battery Electric Vehicle	kW	Kilowatt
CAG	Calculated Annual Growth Rate	kWh	Kilowatt-hour
Caltrans	California Department of Transportation	MD/HD	Medium-duty/heavy-duty
CAISO	California Independent System Operator	MOU	Memorandum of Understanding
CARB	California Air Resources Board	MTC	Metropolitan Transportation Commission
CFI	Charging and Fueling Infrastructure	MW	Megawatt
CEC	California Energy Commission	MY	Model Year
DCFC	Direct Carbon Fuel Cell	NREL	National Renewable Energy Lab
DER	Distributed Energy Resources	OCED	Office of Clean Energy Demonstrations
DMV	Department of Motor Vehicles	PCTPA	Placer County Transportation Planning Agency
DOT	Department of Transportation	PG&E	Pacific Gas & Electric
EaaS	Energy-as-a-Service	Pkwy	Parkway
Energllze	Energy Infrastructure Incentives for Zero-Emission	PPA	Power Purchase Agreement
EPA	Environmental Protection Agency	SACOG	Sacramento Area Council of Governments
EV	Electric Vehicle	SACSIM	Sacramento Activity-Based Travel Demand Simulation model
FCEV	Fuel Cell Electric Vehicle	SJCOG	San Joaquin Council of Governments
FMCSA	Federal Motor Carrier Safety Administration	SMUD	Sacramento Municipal Utility District
GHG	Greenhouse Gas	TaaS	Trucking as a Service
HWY	Highway	ToC	Theory of Change
I	Interstate	ZEV	Zero-Emission Vehicle

Executive Summary

The Northern California Megaregion Zero Emission Medium- and Heavy-Duty Vehicle Study, prepared by Frontier Energy, DKS Associates, Black & Veatch, Momentum, and DIYSL for the Sacramento Area Council of Governments (SACOG), provides a comprehensive strategy to support the transition of medium- and heavy-duty vehicles to zero-emission technologies across the 15-county region. The plan addresses the critical infrastructure issues, policy needs, and community engagement efforts necessary to support this transition.

With approximately 26 million registered vehicles, California faces significant air quality challenges, especially from medium-duty and heavy-duty (MD/HD) vehicles. Though a smaller portion of the overall vehicle population, these vehicles account for approximately 23% of the state's on-road GHG emissions and significantly impact air quality, especially in disadvantaged communities. State regulations, strengthened by U.S. EPA emissions standards, are driving the adoption of zero-emission vehicles (ZEVs) that operate on electricity or hydrogen fuel cells. The Northern California Megaregion, encompassing a diverse landscape and significant economic activities, is at the forefront of this transition.

The project employs a human-centered approach, integrating input from diverse stakeholders, including local governments, utilities, air districts, trucking operators, station developers, and community members. The strategy focuses on forecasting ZEV adoption, identifying optimal sites for charging and hydrogen stations, establishing clear evaluation criteria, and developing detailed, site-specific implementation plans. A comprehensive data collection and analysis process was undertaken to achieve the project's goals. This included mapping existing and planned infrastructure, assessing community impacts, and evaluating utility capacities. The project also prioritized the engagement of disadvantaged communities, ensuring their voices were heard and their needs addressed throughout the planning process.

Under the guidance of a Steering Committee and with significant stakeholder and community input, the plan aims to:

- Identify and build sustainable partnerships
- Take action to enable near-term charging and hydrogen stations
- Specify mid-term “no regrets” decisions for the next stage of development
- Craft long-term policies and processes that avoid having stranded assets

The plan uses data, input, best practices, and real-world experience to identify locations for ZEV stations to enable zero-emission freight and goods movement. Each site has an action plan that includes partnerships, business models, community engagement, electrical upgrades, and roadway improvements needed for the deployment to be successful. Each action plan element has a timeline and a way to measure deployment success.

Locations Identified in the Plan

The Study identified 17 sites for ZEV fueling stations that will support freight and goods movement in the Bay Area, Sacramento region, and Sierra, listed in Table 1. These locations were chosen based on traffic volume, proximity to existing and planned infrastructure, community impact, and utility capacity. When the project started, stakeholders assumed that local government would lead the development of stations. However, private development is leading the way by leveraging federal and state grants, utility incentives, Low Carbon Fuel Standard (LCFS) credits, and federal tax credits.

Six of the original 17 sites (35%) were “claimed” by a station developer during the project. The project team coordinated with the developers to offer support but did not analyze these properties further. The project team evaluated and analyzed 11 sites, shown in Figure 1.

Table 1: Locations Identified for Megaregion ZEV Stations.

Address	City	County	Corridor	Land
1001 Sutter Street	Yuba City	Sutter	Hwy 99	.61 acres, near baseload fleets
695-710 Spaans Drive	Galt	Sacramento	Hwy 99	4 acres on high-travel routes
15314 N. Thornton Road	Lodi	Sacramento	Hwy 99	5 acres on high-travel routes
1422-1510 Boeing Way	Stockton	San Joaquin	Hwy 99 and I-5	11 acres, on high-travel routes, near baseload fleets
8638 Sparling Lane	Dixon	Solano	I-80	Caltrans Maintenance station, large baseload fleet, critical facility during emergencies
2243 Cornelian Drive	South Lake Tahoe	El Dorado	Hwy 50	Caltrans maintenance station, critical facility during emergencies
41975 Nyack Road	Emigrant Gap	Placer	I-80	1 acre, unauthorized truck parking, chain station
8308 Pedrick Road	Dixon	Solano	I-80	10 acres, on high-travel routes, near baseload fleets
3151 South Highway 99	Stockton	San Joaquin	Hwy 99	3 acres, on high-travel routes, near baseload fleets
920 Performance Drive	Stockton	San Joaquin	Hwy 99 and I-5	8 acres, zoned for truck yard, on high-travel routes, near baseload fleets
20781 US HWY 50	South Lake Tahoe	El Dorado	Hwy 50	1 acre, only property on 50 that can be developed
I-80/505 Junction	Vacaville	Solano	I-80	Claimed by developer
Army Depot	Sacramento	Sacramento	Highway 50	Claimed by developer
Industrial Way	West Sacramento	Yolo	I-80/Hwy 50	Claimed by developer
Jack Tone Road	Ripon	San Joaquin	Highway 99	Claimed by developer
Richmond Parkway	Richmond	Contra Costa	I-80	Claimed by developer
Mariposa Road	Stockton	San Joaquin	Highway 99	Claimed by developer

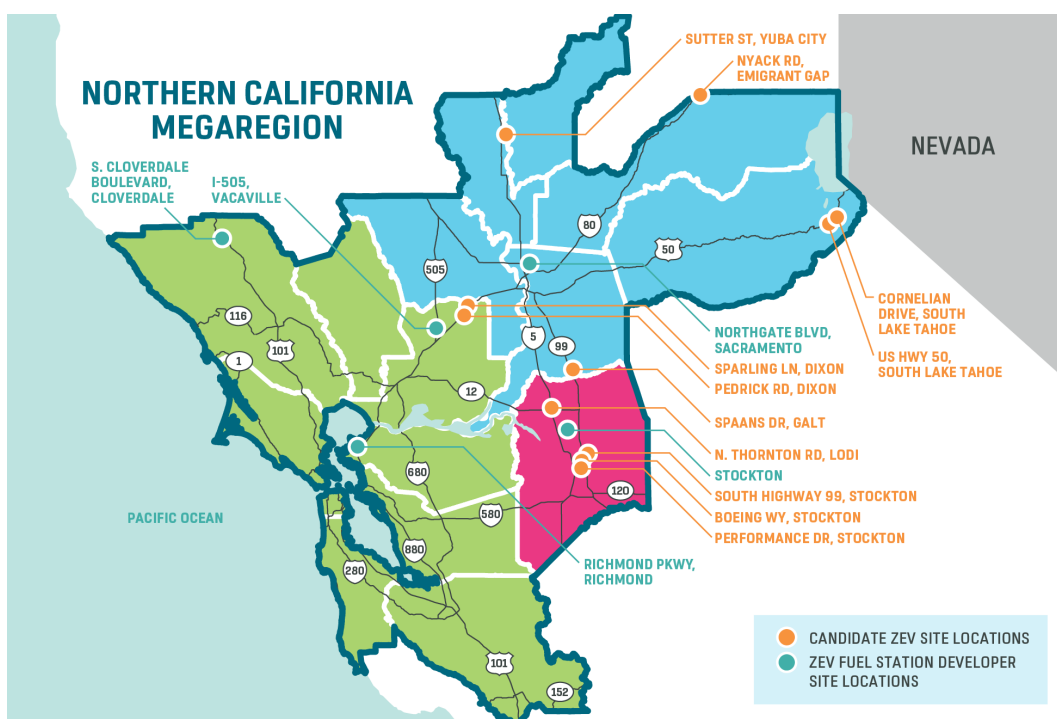


Figure 1: 11 Locations Evaluated to Fill Crucial Gaps to Enable Goods Movement in Northern California.

Key Findings

Key Finding:

Partnerships help planned stations through the “valley of death.”

With federal, state, and private funding, nearly 30 charging and hydrogen stations are open, in development, planned, or proposed in Northern California and are concentrated in Sacramento, around the Port of Oakland, and near Tracy and Lathrop. If all open as scheduled, plugs may outnumber ZEV trucks that need public charging or fueling. To reach a Megaregion goal that 80% of planned stations will be operational in 2035, station operators will need guaranteed customers. Partnerships with local government, school districts, and transit operators could provide a baseload fleet and help these agencies deploy ZEVs. Additionally, Carl Moyer’s funding could give preference to fleets with a partnership with an existing or planned public station.

Key Finding:

Partnerships between local agencies and industry are vital to developing stations that can keep up with the pace of ZEV deployment.

Most station developers want to build a station on acres of undeveloped land, and the Master Plan notes several challenges related to the availability of suitable land for developing ZEV stations. Many areas with undeveloped land are protected from development or are zoned for agricultural or residential use. Industrial land, when available, is often relatively inexpensive. The plan recommends several near-term actions that state and local governments can take to address zoning and permission to build, as well as the potential to use surplus land for future ZEV stations.

Key Finding:

Truck operators need a fail-safe mechanism to avoid increasing costs for customers.

Truck drivers and trucking companies must add ZEV trucks to their fleets on January 1, 2024. They expressed concerns about the limited range and cargo/payload capacity of ZEV trucks and how it will affect their bottom line with the cost of ZEV trucks, additional fueling/charging stops, and staying within regulations for drivers and perishable cargo and livestock. They are concerned that ZEV trucks will raise operational costs, which must be passed to customers, increasing inflation. The plan recommends some near-term actions that the state and federal governments might take to provide more operational security for employers.

Key Finding:

Utilities, local government, and station developers must work together to maximize available electric capacity and plan for additional capacity.

Charging stations need 2-10 MW of electricity for truck charging, which a utility can provide for up to 10 years. Public agencies can form JPAs to build and operate island microgrids for transportation using *SB-1226 Joint powers agreements: zero-emission transportation systems or facilities*. [1]¹ Local governments can partner with utilities to explore options for reducing the time and cost of providing electricity to ZEV stations.

¹ https://leginfo.ca.gov/faces/billTextClient.xhtml?bill_id=202120220SB1226




Measuring and Tracking Progress

The plan employs a Theory of Change framework to track progress toward long-term goals, such as achieving 100% zero-emission transportation by 2045. This framework sets interim milestones, such as having 80% of planned ZEV stations operational by 2035, and outlines specific activities needed to achieve these goals. These activities include offering grants and incentives for ZEVs and stations, allowing charging stations at existing businesses, reducing the cost of green hydrogen, and ensuring grid support for megawatt-level charging. Table 2 shows the outcomes—changes in behavior, attitude, and acceptance—and ways that individuals, groups, and local government can gauge the changes.

Table 2: Measuring and Tracking the Progress of the Action Plan.

Short-Term Outcomes (by 2030)	Mid-Term Outcomes (by 2035)	Long-Term Outcomes (by 2040)
<p>ZEV trucks and stations in the Megaregion demonstrate operational effectiveness for drayage, freight, and agriculture.</p> <p>Measured by changes in:</p> <ul style="list-style-type: none">• Community concerns about safety, noise, and congestion• Business concerns about range and payload• Local government concerns about zoning	<p>ZEV trucks and stations are do-able.</p> <p>Measured by changes in:</p> <ul style="list-style-type: none">• Makes, models, and costs of ZEV trucks• Fast permitting of ZEV stations• Clear benefits to communities• Clear benefits to businesses• Tapering from incentives• “Behind the fence” stations are open to others	<p>The business proposition of ZEVs for goods movement is clean and easy to understand.</p> <p>Measured by changes in:</p> <ul style="list-style-type: none">• % of ZEV trucks in Megaregion exceeds state targets• Number of ZEV miles and access to ZEV fuels• Businesses are self-sustaining• Measurable reduction in GHGs and pollutants

The Action Plan includes near-term actions and assignments that align with the project goals. Some must be tracked through surveys and focus groups, others from grant-related data. The team recommends that SACOG and the Megaregion Working Group evaluate progress on each action at least annually to ensure that future activities align with the goal of 100% zero-emission transportation by 2045.

ACTIVITIES:	WHAT TO DO:	WHO SHOULD DO IT:
 OFFER GRANTS AND INCENTIVES FOR ZEVs AND STATIONS	Continue existing funding programs to close the gap between conventional vehicles and fuels and ZEVs.	FEDERAL GOVERNMENT, STATE GOVERNMENT, UTILITIES
	Consider grants and rebates that encourage ZEVs to use public stations.	COUNCILS OF GOVERNMENT AND AIR DISTRICTS
	Consider a tax credit modeled on the Work Opportunity Tax Credit, which gives an employer a tax credit for wages paid for an employee to charge a truck.	STATE AND FEDERAL GOVERNMENT
 CHARGING STATIONS ALLOWED AT EXISTING BUSINESSES	Articulate to local permitting and planning departments and planning commissions that AB 970 allows charging stations at any business regardless of zoning changes.	GO-BIZ
 COST REDUCTION FOR GREEN HYDROGEN	Reduce the cost of delivering hydrogen to the ARCHES target of \$3/kg.	HYDROGEN PRODUCERS, UTILITIES, ARCHES HYDROGEN HUB

ACTIVITIES:**GRID SUPPORT
FOR MEGAWATTS
OF CHARGING****WHAT TO DO:**

Working with the U.S. Department of Commerce, provide incentives for local production of electrical equipment to reduce the years-long wait for transformers, switchgear, and other components.

Using the U.S. DOE's 2023 Critical Materials Assessment,^A identify opportunities for California businesses and natural resources to supply raw materials needed to build electrical components.

Reduce the regulatory barriers for islanded microgrids at ZEV fuel stations.

Consider how EPIC funding could be shared with small municipal utilities to support electric generation, transmission, and distribution for ZEV fueling stations.

Reduce the barriers to submitting and implementing a GRIP grant for small municipal utilities and cooperatives.^B

Report the outcomes of DERMS and other pilot projects to manage power needs between buildings and vehicles.

WHO SHOULD DO IT:**FEDERAL GOVERNMENT****FEDERAL AND
STATE GOVERNMENT****UTILITIES, CALIFORNIA
PUBLIC UTILITIES
COMMISSION****ENERGY COMMISSION****U.S. DEPARTMENT
OF ENERGY****LARGE UTILITIES**

^A <https://www.energy.gov/cmm/what-are-critical-materials-and-critical-minerals>

^B <https://www.energy.gov/gdo/grid-resilience-and-innovation-partnerships-grip-program>

ACTIVITIES:**REGULATIONS
CONTINUE TO
SUPPORT ZEVS****WHAT TO DO:**

Continue with regulations that are technology-neutral and require-emphasize ZEVS.

Agreement on the maximum weight rating for a ZEV truck, including those used to transport livestock.

Agreement on highway safety standards for heavier trucks, including ramps, guardrails, and barriers.

Agreement about fees and taxes to understand the impact on state and local revenue and identify methods of recouping lost revenue while encouraging ZEV fuels

WHO SHOULD DO IT:

AIR RESOURCES BOARD,
U.S. ENVIRONMENTAL
PROTECTION AGENCY

U.S. DEPARTMENT OF
TRANSPORTATION,
CALIFORNIA DEPARTMENT
OF TRANSPORTATION

U.S. DEPARTMENT OF
TRANSPORTATION,
CALIFORNIA DEPARTMENT
OF TRANSPORTATION,
AMERICAN ASSOCIATION
OF STATE HIGHWAY
AND TRANSPORTATION
OFFICIALS

FEDERAL, STATE, AND
LOCAL GOVERNMENT

**TRUCK
CHARGING
STANDARDS
ARE SET
AND ADOPTED**

Publish and maintain open standards for demand management, megawatt charging, hydrogen fueling, and communication that all ZEVS and stations can use without licenses, fees, or IP agreements.

Collaborate with the groups developing rail, aircraft, and marine standards so that connectors, nozzles, demand management, and communications are coordinated and compatible.

MANUFACTURERS,
STANDARDS DEVELOPMENT
ORGANIZATIONS,
STATE GOVERNMENT

**COST REDUCTION
FOR GREEN
HYDROGEN**

Revise or create a code for ZEV fuel stations similar to local codes for service stations (or similar), which includes design standards, impact fees, and allowable ancillary activities (e.g., sale of alcohol).

Determine the number of charging ports or hydrogen stations an existing business can add before triggering the service station code.

Revise or create standards, which may include "health, safety, peace, morals, comfort, and welfare," to help protect the community and drivers from the unintended consequences of ZEV stations.

LOCAL GOVERNMENT,
GO-BIZ

LOCAL GOVERNMENT

Conclusion

The Northern California Megaregion ZEV Master Plan provides a data-driven, strategic approach to transitioning to zero-emission medium- and heavy-duty vehicles. By addressing infrastructure needs, leveraging regulatory support, and fostering community engagement, the plan aims to create a sustainable and equitable path toward reducing the environmental impact of freight transportation in Northern California. This coordinated effort will contribute to California's ambitious climate goals and improve air quality and public health in the region.

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Introduction

Enabling the Adoption of ZEVs in the 15-County Megaregion

California has about 26 million registered motorized vehicles² plus tens of thousands of vehicles registered elsewhere driving on California roadways. Within the Northern California Megaregion, over 64,000 medium-duty and heavy-duty (MD/HD) vehicles are operating today. MD/HD vehicles that range from 1-ton pickups to long-haul semi-tractors are a small percentage of the vehicle population but are responsible for about 23% of the state's on-road greenhouse gas (GHG) emissions. Trucks and buses are the largest contributors to other air pollutants that adversely affect health and the environment and disproportionately burden the state's disadvantaged communities.

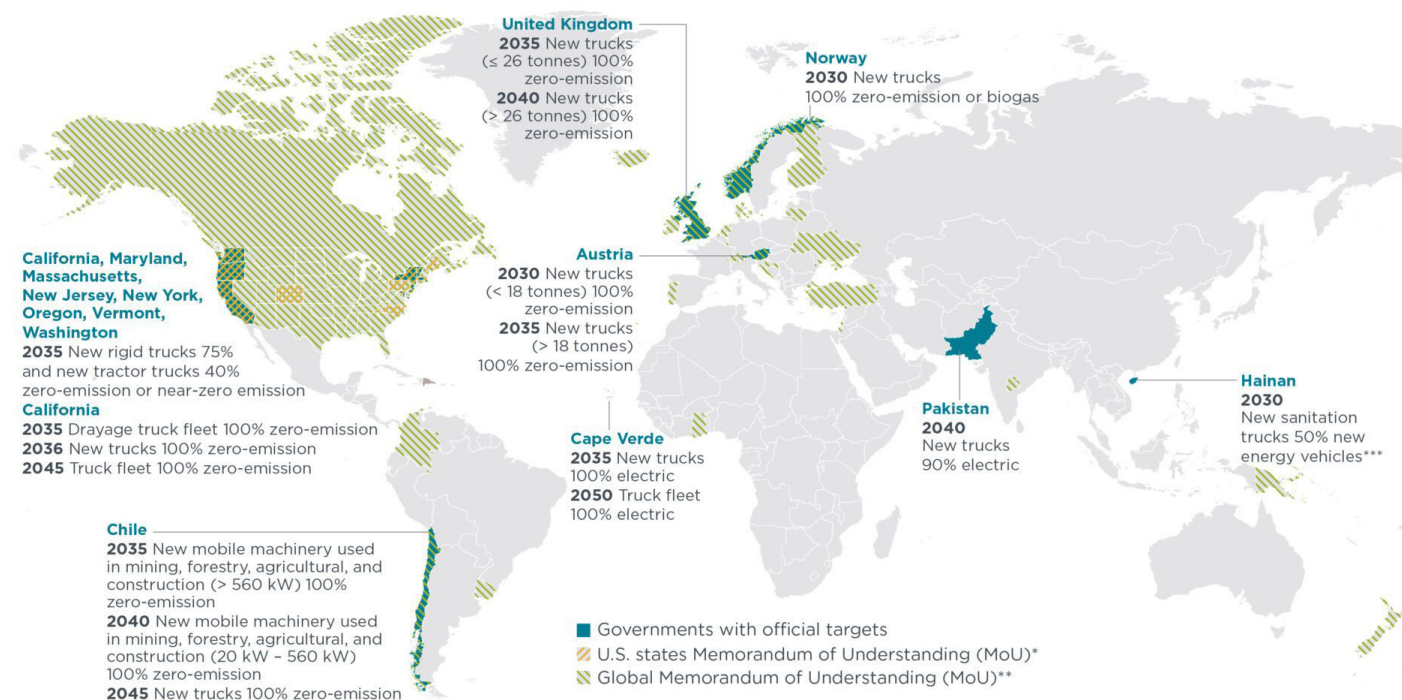
State of California regulations, bolstered by U.S. EPA tailpipe emissions standards, push buyers and sellers toward zero-emission vehicles (ZEVs) that run on electricity stored in a battery or created in a fuel cell onboard the vehicle. Although California leads the transition, regulations mandating ZEV truck adoption have been implemented worldwide³, as mapped in Figure 2. The transition of trucks to battery and fuel cell electric vehicles requires a broad, well-orchestrated deployment of electric charging and hydrogen fueling stations. At the same time, potential station developers want certainty about future customer revenues before investing the necessary capital. It is the ongoing "chicken-and-egg" dilemma.

² <https://www.dmv.ca.gov/portal/file/california-dmv-statistics-pdf/>

³ <https://zevtc.org/tracking-progress/heavy-duty-vehicle-map/>

Figure 2: ZEV Truck Regulations Implemented Worldwide. (Source: ZEV Transition Council)

Governments with targets toward phasing in sales of new zero CO₂ emission medium- and heavy-duty trucks by a certain date (Status: Through February 2024)



Note: Governments with an at least 40% sales target for zero-emission new trucks.

* New medium- and heavy-duty vehicles at least 30% zero-emission in 2030 and 100% no later than 2050. Not necessarily reflected yet in an official state policy document such as a climate or transport strategy/plan, in a law, or in a similar framework.

** New medium- and heavy-duty vehicles 30% zero-emission in 2030 and 100% by 2040. Not necessarily reflected yet in an official national policy document such as a climate or transport strategy/plan, in a law, or in a similar framework. Other national and state level global MoU signatories are: Aruba, California, Curaçao, Liechtenstein, Luxembourg, Québec, Scotland, Sint Maarten, and Wales.

*** New energy vehicles (NEVs) refer to battery electric, hydrogen fuel cell electric, and plug-in hybrid electric power trains.

The Megaregion Study aims to find a solution to part—or all—of this dilemma by developing a regional plan and integrated approach that includes local governments, utilities, air districts, trucking operators, station developers, and other regional stakeholders in the 15-county region that extends from the Pacific Ocean to the Nevada state line.

This study provides the vision, leadership, and direction to instill confidence that zero-emission infrastructure and vehicles will be deployed in concert, enabling the uninterrupted movement of goods throughout the region. The plan leverages other initiatives in and around the megaregion. It identifies specific actions that local governments can take to create an environment conducive to the economic opportunities that zero-emission freight brings about. It also pays particular attention to the needs of the people and communities that live along freight corridors.

The plan uses data, input, best practices, and real-world experience to identify locations for 15 ZEV stations to enable zero-emission freight and goods movement.

Overall, this plan will show that ZEV trucking is achievable and will create an express lane to streamline adoption in Northern California by outlining regional goals and emphasizing local actions. The goal is to outline a realistic plan that enables economic development and focuses on equity in the communities that traffic-related impacts have most harmed.

Under the guidance of a steering committee and with significant stakeholder and community input, the plan aims to:

- Identify and build sustainable partnerships.
- Take action to enable near-term charging and hydrogen stations.
- Specify mid-term “no regrets” decisions for the next stage of development.
- Craft long-term policies and processes that avoid having stranded assets.

The plan uses data, input, best practices, and real-world experience to identify locations for 15 ZEV stations to enable zero-emission freight and goods movement. Each site has an action plan that includes partnerships, business models, community engagement, electrical upgrades, and roadway improvements needed for the deployment to be successful. Each action plan element has a timeline and a way to measure success.

Fueling for ZEV Trucks: From “One-day” to “Now”

More than 30,000 trucks in the Megaregion will transition to ZEVs by 2030. Caltrans awarded SACOG funding to implement a study to identify actions and milestones to implement the electric charging and hydrogen refueling infrastructure needed to support the deployment of medium-duty/heavy-duty zero-emission vehicles. Building upon the three-state 2020 West Coast Clean Transit Corridor Initiative’s



recommendations, SACOG and its partners, the San Joaquin Council of Governments, and the Metropolitan Transportation Commission contracted with Frontier Energy and its partners to create the Megaregion Master Plan that calls for at least 11 zero-emission fueling stations for trucks along the major freight corridors: I-5, I-80, Highway 99, Highway 50, I-580 and I-205.

Just as work on this study began, the California Air Resources Board adopted the Advanced Clean Trucks regulation⁴ and introduced the Advanced Clean Fleets regulation.⁵ These require the sale and the purchase of ZEV trucks, respectively. The California Energy Commission introduced the Energy Infrastructure Incentives for Zero-Emission (EnergiIze) Commercial Vehicles Project, which funds publicly accessible hydrogen and charging stations

for MD/HD vehicles. The federal government created the Joint Office of Energy and Transportation to administer billions of dollars in funding for charging and hydrogen infrastructure, and the Department of Energy issued a \$7 billion opportunity for hydrogen hubs⁸

Within a short period, MD/HD ZEVs and ZEV fueling stations transformed from a “one-day” idea that the local government would need to support to a “now” technology that the local government needs to enable. Commercial vehicle operators must have confidence that the infrastructure is adequate to consider purchasing (or leasing) a ZEV. Although the station developers have different business models, all need a path to profitability.

⁴ <https://ww2.arb.ca.gov/our-work/programs/advanced-clean-trucks>

⁵ <https://ww2.arb.ca.gov/our-work/programs/advanced-clean-fleets>

⁶ <https://www.energiize.org/about>

⁷ <https://driveelectric.gov/>

⁸ <https://www.energy.gov/oced/regional-clean-hydrogen-hubs-0>

Based on interviews with operators, drivers, and developers, this study has found that “adequate” means various things.

Operators & Drivers

- Within a short drive of the planned route
- Having little or no wait time for a dispenser
- Accessible (having no gate or code for entrance)
- With easy payment options
- Having redundancy/resiliency solutions to ensure fuel is available if the station is taken down, the power is out, or the vehicle must take an alternative route

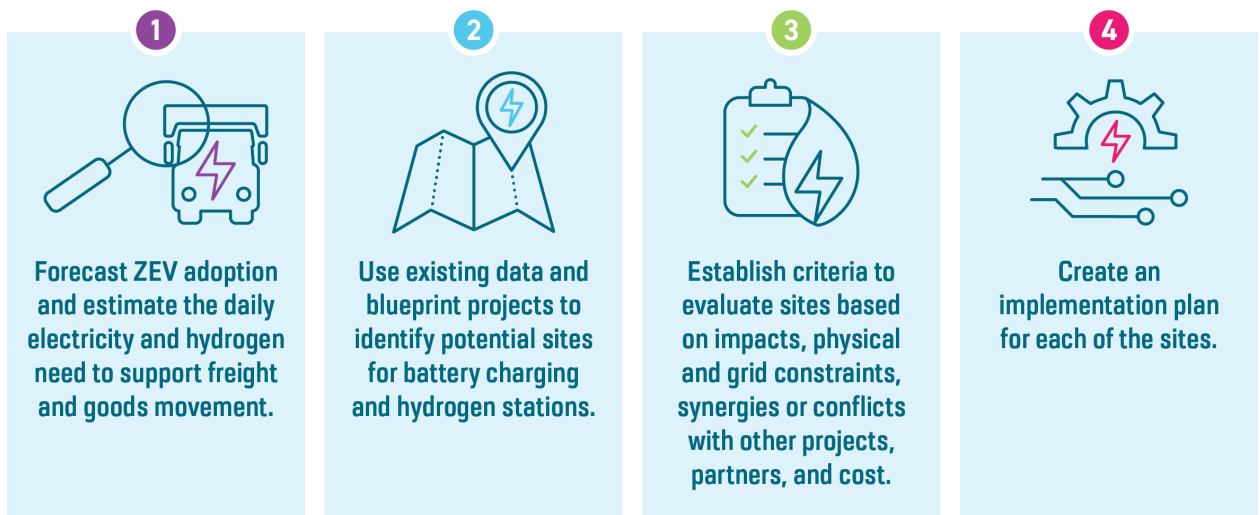
Station Developers

- Enabling a baseload of customers
- Allowing predictable cost of energy
- Ensuring reliable distribution
- With easy payment options
- With ability to attract other businesses as leaseholders on the property - retail, food service, repair services, car washes, and renewable energy generation

Using a Human-Centered Approach

The Frontier team proposed a human-centered approach that led with the ideas and knowledge from SACOG, regional stakeholders, and a steering committee and incorporated Justice40 principles to ensure that voices from disadvantaged communities were heard throughout the project.⁹

The Study is articulated along the following process stages:



⁹ <https://www.whitehouse.gov/environmentaljustice/justice40/>

The transition from fossil fuels to electricity and hydrogen is more than an exercise in math and geography. It must incorporate how companies operate, their business models, and changes to the community. The project team directed the work using existing data, stakeholders, community engagement, and a very involved steering committee. At each project stage, the team consistently applied Justice40 principles to make it an inclusive, equitable project so that communities would benefit from ZEV stations.

Goods Movement in the Northern California Megaregion

As shown in Figure 3, the Northern California Megaregion comprises 15 counties within a diverse landscape that spans urban, suburban, and rural areas. The geography ranges from fertile agricultural lands to high-density urban areas to forested mountains.

The Metropolitan Transportation Commission (MTC) estimated that more than \$1.0 trillion of freight moved to, from, or within the Northern California Megaregion in 2015, and trucking accounted for 74.1% of these trucking flows. More specifically, segments of I-880, the I-580 Altamont Pass, and I-5 between Stockton and Manteca—which connect the Port of Oakland to the Northern San Joaquin Valley’s intermodal terminals—carry between 15,000 and 37,000 trucks per day on average.¹⁰

Figure 3: The 15 Counties’ Diverse Landscape Includes Cities, Farmland, Mountains, and Forests.



Although the region hosts diverse industries and sectors, it is dominated by food production (agriculture, food processing, and distribution), healthcare, and logistics. The Port of Oakland is a global gateway for goods movement and discharges more than 99% of the containerized goods moving through Northern California.¹¹

¹⁰ <http://www.bayareaeconomy.org/report/the-northern-california-megaregion/>

¹¹ <https://www.oaklandseaport.com/performance/facts-figures/>

Many small private ports dot the San Francisco Bay and Delta in addition to the four major state ports, each specialized in handling a type of bulk product.

- The Port of Richmond handles bulk liquid and automobiles.
- The Ports of Stockton and West Sacramento specialize in bulk agriculture and building materials.
- The Port of Redwood City handles dry bulk materials.

Moreover, the region has four significant intermodal facilities offering truck-to-rail or rail-to-barge (and vice versa) services to industries.

- The Stockton Intermodal Facility provides connection to BNSF rail service at the Port of Stockton.
- The Lathrop Intermodal Facility provides connection to UP rail service, located just south of the Port of Stockton.
- The Railport Intermodal Yard at the Port of Oakland provides connection to UP rail service.
- The Oakland International Gateway Intermodal Facility at the Port of Oakland provides connections to the BNSF rail service.

The Union Pacific Yard in Roseville is the largest rail yard on the West Coast. It is crucial for freight operations, railcar sorting, and maintenance servicing all four of these intermodal terminals.

According to *MTC's Northern California Megaregion Goods Movement Study*,¹² freight-dependent industries that most depend on truck, rail, and marine transport in the region are:

- **Agriculture:** growing crops, raising animals, harvesting timber, fishing, and aquaculture.
- **Construction:** buildings and engineering projects.
- **Manufacturing:** mechanical, physical, or chemical transformation of materials, substances, or components into new products.
- **Wholesale Trade:** wholesaling merchandise, which includes outputs from other sectors.
- **Retail Trade:** retailing merchandise.

Fuel provision across the region will be vital in the long term, but the initial focus is on enabling goods movement on the busiest routes.

¹² https://mtc.ca.gov/sites/default/files/Northern_California_Megaregion_Goods_Movement_Study.pdf

"If you don't build stations in places like Lone, Plymouth, Soda Springs, and Knights Ferry, then those communities will never get another package from Amazon or UPS."

Community member's comment during interviews

The Seasonality of Agriculture

The California Department of Food and Agriculture (CDFA) lists annual statistics for agriculture by county, and eight of the 15 Megaregion counties are in the top 25 for the value of crop and livestock production.¹³ Table 3 shows the top agriculture-producing counties and the primary commodities grown, processed, or produced in each county.

Although some commodities, like mushrooms, are grown year-round, most have specific planting and harvest seasons. For example, most rice fields are sowed in March and harvested in September, which results in hundreds of trucks carrying rice from fields to

Table 3: Megaregion's Top Agriculture Producers in 2022. (Source: CDFA)

County	Leading Commodities
San Joaquin	Milk, Almonds, Grapes, Cherries
Napa	Grapes, Cattle, Livestock Products, Sheep
Sonoma	Grapes, Horticulture, Milk, Livestock Products
Yolo	Tomatoes, Grapes, Almonds, Alfalfa
Sacramento	Grapes, Pears, Milk, Corn
Sutter	Rice, Tomatoes, Prunes, Walnuts
Solano	Vegetables, Tomatoes, Horticulture, Cattle
Santa Clara	Horticulture, Mushrooms, Vegetables, Lettuce
Yuba	Rice, Prunes, Livestock, Walnuts
Contra Costa	Cattle, Corn, Tomatoes, Horticulture
Marin	Milk, Poultry, Cattle
Placer	Rice, Cattle, Horticulture, Livestock
El Dorado	Cattle, Timber, Apples
Nevada	Cattle, Pasture, Vegetables, Livestock

¹³ https://www.cdfa.ca.gov/Statistics/PDFs/2022-2023_california_agricultural_statistics_review.pdf

milling facilities for just a few weeks. Grapes have a longer harvest season—May through January—and are often processed and packed in the field and then sent to cold storage facilities for worldwide distribution.¹⁴ According to Caltrans' Freight Mobility Action Plan, most of California's agricultural produce travels by truck and often on rural highways and local roads without a direct link to the interstate systems. The Action Plan states that the ZEV transition creates unique challenges to the agricultural goods movement.¹⁵



California Regulations Driving the Adoption of Zero-Emission Trucks

- 1. Advanced Clean Fleets** requires that all new trucks for drayage or added to a "priority fleet" be zero-emission. By 2035, all drayage trucks will be ZEVs; by 2042, all trucks for goods movement will be ZEVs.
- 2. Advanced Clean Trucks** requires manufacturers and dealers to sell a percentage of ZEV trucks annually. By 2035, zero-emission truck/chassis sales would need to be 55% of Class 2b-3 truck sales, 75% of Class 4-8 straight truck sales, and 40% of truck tractor sales.
- 3. Innovative Clean Transit** requires that all transit operators transition to ZEVs. By 2040, all transit buses in operation must be ZEVs.
- 4. Advanced Clean Cars II** requires that dealerships sell an increasing percentage of ZEV beginning with the 2026 model year. By 2035, 100% of light-duty vehicles and 75% of medium-duty trucks and vans will be ZEVs.

The U.S. EPA's Multi-Pollutant Emissions Standards, released in March 2024, also set aggressive targets for reducing GHGs from passenger vehicles and light trucks starting with the 2027 model year (MY).¹⁶ The EPA projects that by MY 2030-2032, up to 56% of passenger vehicles and 32% of medium-duty vehicles will be BEVs, and plug-in hybrids will be more widely available.

¹⁴ <https://www.grapesfromcalifornia.com/annual-grapevine-cycle/#after-harvest>

¹⁵ <https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/cfmp-2023-toc/cfmpfinaljuly0720233cexistingfeight11y.pdf>

¹⁶ <https://www.epa.gov/regulations-emissions-vehicles-and-engines/final-rule-multi-pollutant-emissions-standards-model>

The Megaregion ZEV Transition

The count of MD/HD vehicles has always been complex. Trucks and buses are required to obtain various permits, insurance, and registrations, but each document exempts different types of vehicles. Documentation and registration are often issued at a business address, usually different from the domicile address.

Frontier Energy combined the public data sets available from California Highway Patrol, California Air Resources Board, California Department of Motor Vehicles, and U.S. Department of Transportation data from ProsperFleet, a commercial database, to estimate the number of MD/HD vehicles that have a terminal in the project area and appear to be used for goods movement, freight, and logistics. Vehicles have then been sorted into three broad categories.

Large Fleets: Terminals with ten or more trucks are likelier to own a building or have a long-term lease and a better potential for depot charging stations. Table 4 shows the five cities with the largest total number of trucks and the largest number of unique terminals.

Interim Report: Vehicle Inventory and Forecast

Table 4: Cities with the Largest Number of Trucks in Large Fleets (Ten or More Trucks).

City	Total Number of Trucks	Unique Terminals	County
Stockton	3,610	98	San Joaquin
Sacramento	3,398	123	Sacramento
Oakland	2,205	42	Alameda
West Sacramento	1,653	43	Yolo
San Jose	1,555	50	Santa Clara
Totals	12,421	356	

Small Fleets: Terminals with 3-9 trucks are more commonly in leased buildings, have shared parking lots, and may have limited ability to install charging stations. Table 5 shows the cities with the largest counts of trucks and unique terminals by town.

Table 5: Cities with the Largest Counts of Trucks In Small Fleets (3-9 Trucks).

City	Total Number of Trucks	Unique Terminals	County
Sacramento	1,366	272	Sacramento
Stockton	872	187	San Joaquin
Hayward	566	118	Alameda
Manteca	541	112	San Joaquin
Yuba City	504	99	Yuba
Oakland	398	84	Alameda
Tracy	350	68	San Joaquin
Santa Rosa	337	63	Sonoma
West Sacramento	310	60	Yolo
Elk Grove	271	53	Sacramento
Lathrop	247	49	San Joaquin
Richmond	232	45	Alameda
San Francisco	212	49	San Francisco
Woodland	209	50	Yolo
San Leandro	200	37	Alameda
Totals	6,615	1,346	

Owners/Operators: Terminals with 1-2 trucks, often operated by individual owners who register trucks at their home address and park elsewhere. These operators rely on public charging and fueling. Table 6 lists the total number of trucks at unique addresses in each county within the Megaregion.

Using the data in the above tables, Frontier calculated growth with the following assumptions:

- 67,641 existing trucks in the region (gas, diesel, and natural gas)
- The Calculated Annual Growth Rate (CAGR) is 4% per year (based on pre-pandemic historical data for sales of Class 4-8 new trucks by S&P Global Mobility)
- 32,500 trucks are subject to Advanced Clean Fleet (ACF) and will be transited to ZEVs by 2035. Fleets subject to ACF will transition to BEV and H2FCV more quickly than unregulated fleets and operators
- By 2035, ZEV trucks will reach the total cost of driving parity with diesel vehicles¹⁷
- For heavy trucks with a range of 250+ miles, the projected percentage of fuel-cell electric vehicles will increase over time¹⁴: 2% until 2030, 17% between 2031 and 2035, and 50% after 2036.
- As of December 2023, 65 ZEV trucks were delivered to addresses in the study area, 26 of which were delivered to one zip code in Santa Clara County. Additionally, 83 BEV vans were delivered to addresses in the study area, most of which were last-mile delivery vans operated by one company.¹⁸

Table 6: Number of Addresses that Have 1-2 Trucks Registered by County.

City	Unique Terminals
San Joaquin	4,522
Alameda	4,267
Sacramento	3,681
Santa Clara	2,424
Contra Costa	1,626
Sutter	934
Solano	932
Sonoma	922
Yolo	703
San Mateo	702
Placer	653
San Francisco	446
Marin	230
Napa	228
Yuba	175
El Dorado	174
Total	22,619

¹⁷ www.nrel.gov/docs/fy22osti/82081.pdf

¹⁸ <https://www.energy.ca.gov/data-reports/energy-almanac/zero-emission-vehicle-and-infrastructure-statistics-collection/medium>

Frontier estimated that 32,500 trucks in the Megaregion will transition to ZEVs by 2030, and by 2043, 80,000 ZEV trucks will carry goods throughout the region. Figure 4 illustrates the forecast of the transition to ZEVs, which is slow initially and accelerates as costs come down and the operational range and payload become comparable to traditional vehicles. By 2043, all vehicles will likely operate on batteries or hydrogen, potentially combining the two. The project's forecast aligns with State agencies' reports but has three specific differences:

- 1. Other studies reference forecasts by the California Air Resources Board.**

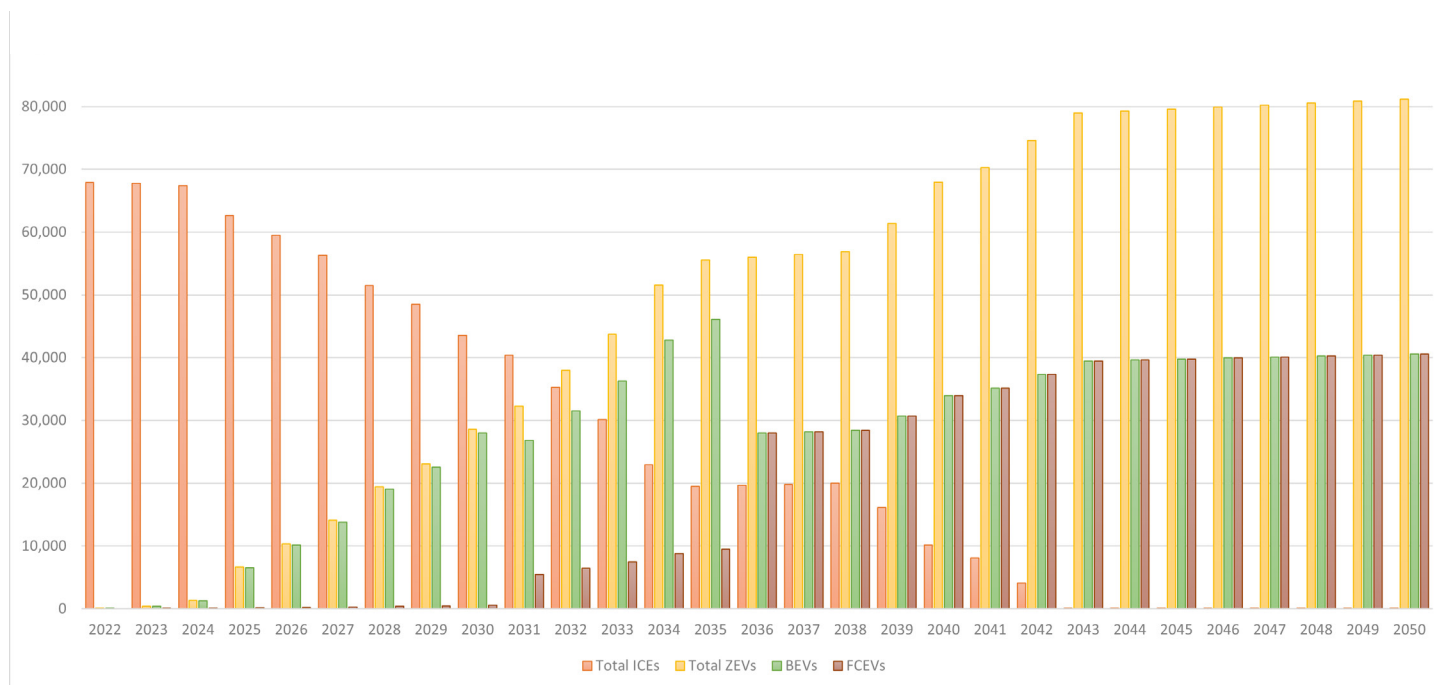
Still, they are only for benchmark years 2025, 2030, 2035, and 2040 and are based on the Advanced Clean Trucks regulation, which requires the sale of zero-emission trucks.¹⁹

- 2. Many forecasts assume that 100% of ZEV trucks will be battery-electric.**

The California Transportation Commission study also included a scenario in which 33% of the trucks are hydrogen fuel cells.²⁰ The Megaregion project used projections from the National Renewable Energy Lab (NREL) that are more nuanced about the powertrain based on truck type.²¹

- 3. All other studies are statewide.** The Megaregion project considers only vehicles that are registered or assigned to businesses in the 15 counties.

Figure 4: The Forecast of ZEV Truck Adoption in the Megaregion by 2050. (Source: Frontier Energy)



¹⁹ <https://ww2.arb.ca.gov/resources/documents/advanced-clean-trucks-compliance-and-incentives-update>

²⁰ <https://catc.ca.gov/-/media/ctc-media/documents/ctc-meetings/2023/2023-12/14-4-4.pdf>

²¹ www.nrel.gov/docs/fy22osti/82081.pdf

Stakeholder Interviews: Understanding Real-World Operations

Frontier conducted 26 interviews with trucking companies, owners/operators, business groups, and station developers to better understand real-world operations. Frontier asked interviewees about future ZEV business plans and asked them to share their opinions about locations and sites of public ZEV fueling infrastructure for medium—and heavy-duty vehicles that use the highways.

Frontier asked interviewees about future ZEV business plans and asked them to share their opinions about locations and sites of public ZEV fueling infrastructure.

Frontier previously conducted focus groups and interviews with similar participants for CEC-funded Medium- and Heavy-Duty Blueprints, market research for utilities, and on behalf of the Department of Energy and included those responses.

Feedback from Private Sector Interviews

- **A shorter range of ZEV trucks leads to a loss of time.** Fleet operators see ZEV range as a significant barrier because of the number of times drivers will need to stop to charge or refuel. Specifically for charging, operators stated that adding an hour-long stop during the day is an operational expense they can't afford.
- **Station developers don't understand Northern California routes.** Northern California drayage drivers make one trip a day between Oakland and a warehouse, which differs from drayage operations in Southern California ports. Trucking operators stated that station developers don't understand their fleets, and most didn't know that drayage is one trip a day in the Bay Area.
- **FaaS and CaaS are bridges to operation, not a business model.** Operators do not see Fleet as a Service (FaaS) or Charging as a Service (CaaS) as a long-term business model for their operations but rather as a bridge to build their ZEV fleet. They believe every "service" model adds a small markup; when added together, all the small markups are a significant operational expense.

- **Hydrogen is a better option for long routes.** Operators who travel more than 100 miles daily believe it is a better option for trucks and buses but are concerned about its high cost.
- **Station developers want to build from the ground up.** Station developers prefer to own the land where they will build a ZEV station, and some have plans for restaurants, stores, overnight parking, and renewable energy generation and storage. They are less interested in adding charging or fueling to an existing station or being a tenant on another owner's property.
- **Station developers need incentives to break even.** Most station developers do not see a near-term business case for selling ZEV fuels, leasing part of the land, or distributed energy generation (DER). Developers say they need grants, incentives, subsidies, tax credits, and carbon credits for up to 10 years to break even.
- **Developers and drivers are both concerned about the workday.** The time it takes to charge a vehicle can impact business operations and could lead to a driver exceeding their DOT Hours of Service rules.²²
- **Today's vehicle, fuel, and station development costs are too high.** Developers and operators are concerned about the cost differential between ZEVs and conventional equipment. They also worry about the unknown insurance costs, repairs, maintenance, and vehicle end-of-life.
- **Vehicle reliability and fueling options are unknown.** Drivers and trucking operators have heard stories and had experience with trucks and stations being inoperable and waiting weeks—or months—for repair. In the Megaregion, operators are especially concerned about the availability of ZEV fuels because of the seasonality and unpredictability of agriculture-related trucking.



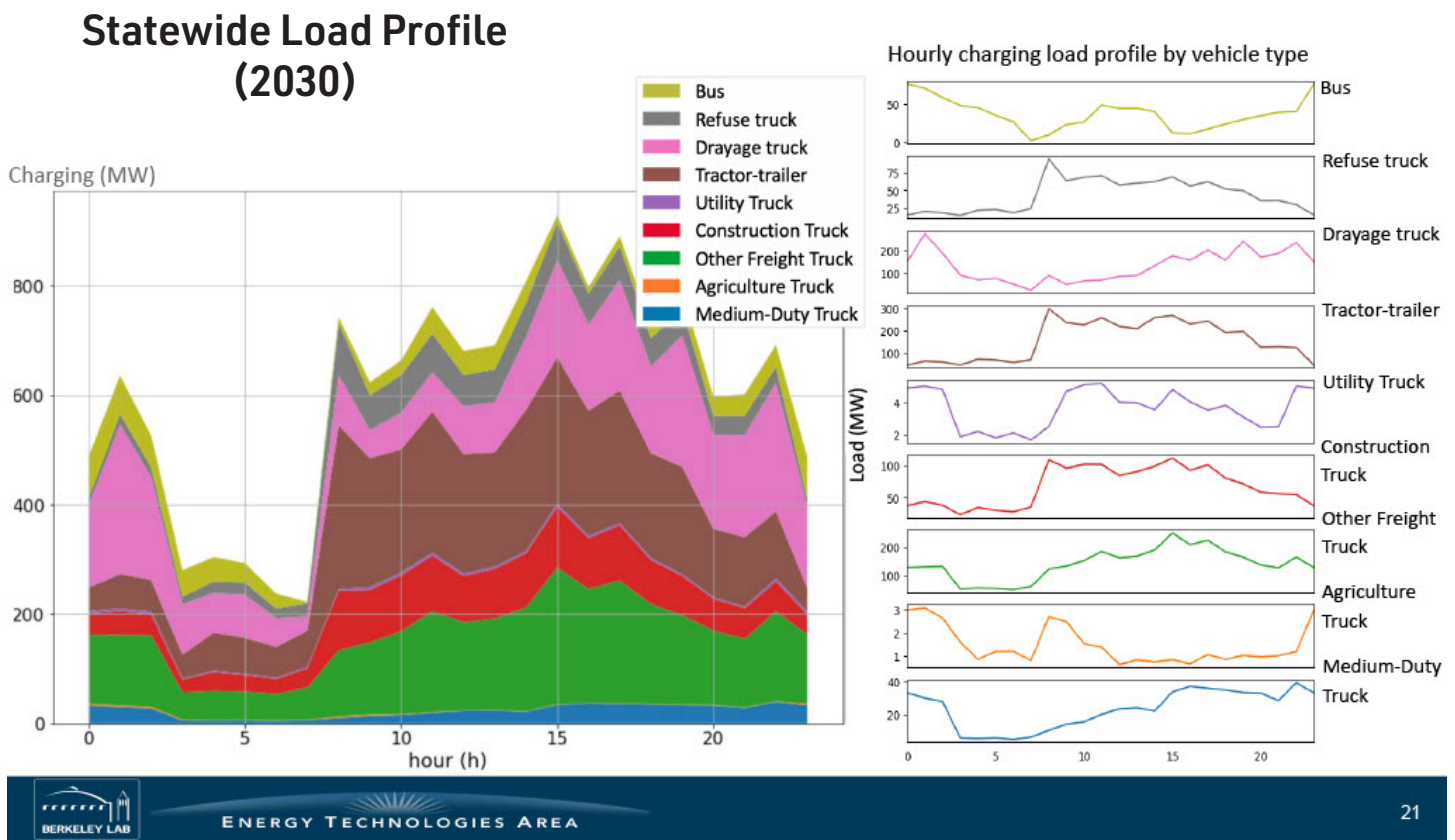
²² <https://www.fmcsa.dot.gov/regulations/hours-service/summary-hours-service-regulations>

Estimating Electrical Grid Demand in the Megaregion

The project team referenced data from multiple previous studies, including the HEVI-LOAD tool that Berkeley Lab is creating to assess statewide electrical use.²³ Nearly all studies estimate grid load by geography based on the number and types of BEV vehicles and the hours they are expected to charge, illustrated in Figure 5 from the HEVI-LOAD model.

Interim Report: Capacity Assessments

Figure 5: HEVI-LOAD Estimate of the Statewide Impact of Charging Stations. (Source: LBNL)



²³ <https://transportation.lbl.gov/vehicles-and-grid>

“Ideally, we’ll have five or six trucks charging at one time. We need 2-3 MW of electricity at the site.”

Charging station developer interview



The project team met with representatives from PG&E, East Bay Community Energy, SMUD, MCE, Lodi Electric Company, Tahoe Public Utilities District, Liberty Utilities, and Roseville Electric to gain insight and consensus on the method for forecasting and evaluating grid capacity at Megaregion sites. Participants encouraged the project team to calculate the load based on the number of charging stations at each location instead of estimating the truck battery sizes and to evaluate strategies to reduce the load.

Using this guidance, the project team used the following parameters:

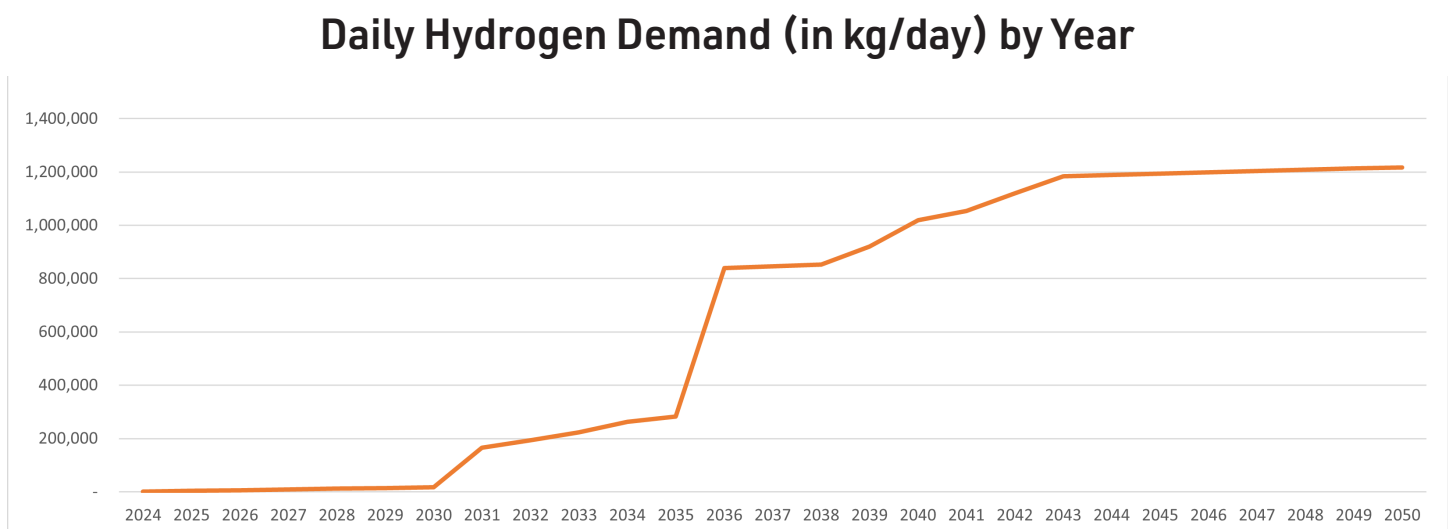
- The square footage of the parking area, less the space required for non-charging activities (drive aisle, landscaping, electrical equipment, buildings, etc.).
 - The number and types of charging stations that can fit in the parking lot, less the square footage of the charging station islands or pedestal and ingress, egress, and buffer space as required in California Building Code
 - Charger power consumption in kW
 - Dynamic system voltage parameter based on utility delivery (e.g., 480V, 1kV)
-
- Static load for lights, security systems, buildings, and other non-charging-related uses
 - Default delivery voltage is 277/480V service
 - Each charger is rated for 360kW
 - Static load will have an 80% rated 400A service

Using this formula, the expected electrical capacity ranges from about .5 megawatts for two DCFCs to more than 13 megawatts for a charging plaza with 75 DCFCs.

Estimating Daily Hydrogen Demand in the Megaregion

NREL projects that 13 % of trucks and buses will be powered by fuel cells and that Class 8 trucks will have a fuel economy of 17 miles per kilogram (kg) by 2041.²⁴ Class 8 fuel cell trucks (FCET) from Hyundai and Kenworth/Toyota have a 450-mile range and carry about 38kg of hydrogen compressed to 700 bars. Assuming that each truck will need 30 kg of hydrogen daily and that FCET adoption follows the NREL forecast, Figure 6 shows the daily demand for hydrogen from stations in the Megaregion.

Figure 6: Sharp Increases in Daily Hydrogen Demand as Fuel Cell Trucks Become More Available. (Source: Frontier Energy)



This forecast mirrors the finding of NREL's *Decarbonizing Medium- & Heavy-Duty On-Road Vehicles*.²⁵ With a peak in electricity demand for truck charging in 2035 and a sharp decline as hydrogen-powered trucks enter the market in force. This is an essential consideration for building the electric grid for trucks. In the middle of the next decade, additional grid resources may be available for light-duty vehicles, buildings, or industrial use.

²⁴ https://www.hydrogen.energy.gov/pdfs/19006_hydrogen_class8_long_haul_truck_targets.pdf

²⁵ www.nrel.gov/docs/fy22osti/82081.pdf

FCET capacity and range are similar to those of a fuel cell transit bus, so the project team used AC Transit's Emeryville hydrogen station as a baseline to forecast hydrogen needs.²⁶ The AC Transit hydrogen station was initially built in 2011 to fuel 12 buses. In 2020, it was upgraded with a 15,000-gallon liquid hydrogen storage tank, dual ADC MP-100 Cryogenic Pumps, high-pressure vaporizers, and 1,750kg of high-pressure gaseous storage.



All fuel cell vehicles use hydrogen as a compressed gas measured in kilograms. If FCETs have at least 3 kg in their tanks when they arrive at the station, high-pressure storage of 1,750 kg of hydrogen will fill approximately 50 trucks or buses at 35 kilograms each. High-pressure storage can be replenished as it's used when a station has liquid storage or on-site hydrogen production. Currently, all hydrogen must be stored above ground. Although national laboratories and universities have studied underground storage for decades, it is not yet viable.

Daily hydrogen demand is a factor of station size rather than location, and station operators can increase hydrogen throughput

by adding storage and increasing the number of dispensers. Based on interviews with hydrogen station developers and recent grant awards, the project team expects the initial hydrogen stations to have 15-20,000 gallons of liquid storage and a daily throughput of 1,000 kg daily (about 33 trucks per station).

By 2031, the Megaregion will have about 5,500 fuel-cell trucks. If each FCET needs 30 kg of hydrogen daily, the region will dispense 165,000 kg daily. This will require stations that serve at least 100 trucks daily and have a daily throughput of 4,000-5,000 kg of hydrogen.

²⁶ https://www.actransit.org/sites/default/files/2022-06/0105-22%20Report-ZETBTA%20v3_FNL.pdf

ZEV Stations to Enable Goods Movement in Northern California

The project aimed to identify fueling locations that would enable goods movement along the major freight corridors in Northern California, which are:



An east/west corridor between San Francisco and the Nevada border



A north/south corridor in San Joaquin, Sacramento, and Yolo Counties



A north/south corridor in San Joaquin, Sacramento, Sutter, and Yuba Counties



An east/west corridor between Tracy (San Joaquin County) and San Rafael (Marin County)²⁷



A north/south corridor between Oakland and San Jose



A north/south corridor between San Francisco and San Jose



A north/south corridor between San Jose and Cordelia (Solano County)

Interim Reports:

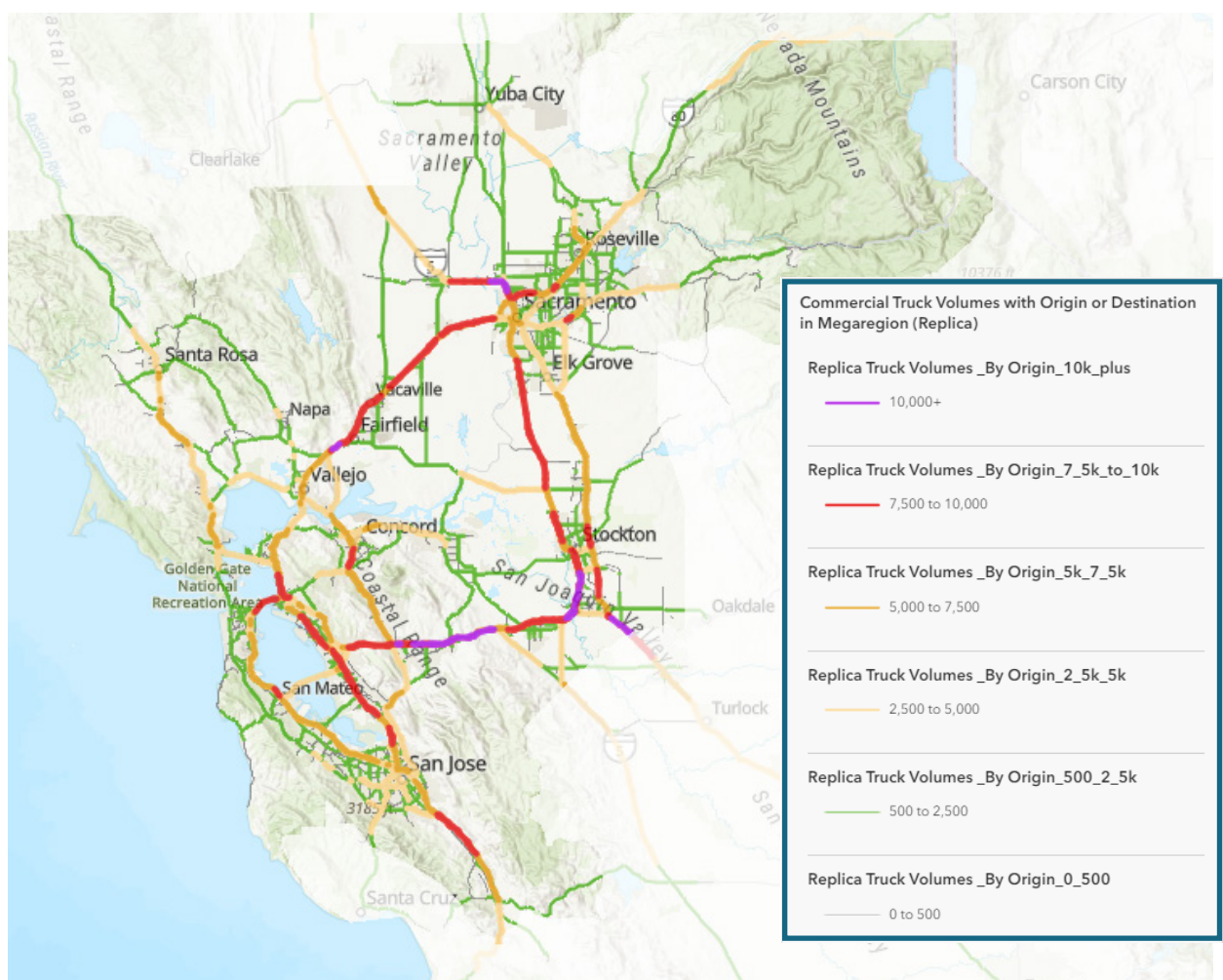
Candidate Sites for
Megaregion Study,
Leveraging Upcoming
Projects, Opportunities with
Emerging Technologies

²⁷ I-580 also has north/south stretches in San Joaquin and Alameda Counties

Freight also moves along other highways and state routes, including Highway 101 along the coast; Highways 12 and 123 in the Wine Country; Highways 20, 49, and 65 in the Sierra Foothills; and Highways 50, 4, and 88 in the Sierra Mountains.

Figure 7 is a layer of the GIS map created for the project that shows the volume of truck traffic on highways and interstates from Replica. This commercial data provider aggregates and normalizes telematics and GPS data to visualize traffic counts, speeds, turning movements, and parking locations. Darker lines indicate more significant daily freight traffic.

Figure 7: Daily Volume of Truck Traffic on Northern California Highways and Interstates. (Source: Replica And DKS Associates)



In addition to traffic volumes, the project team used various sources of data and information (listed in Appendix C) to identify potential locations for public charging and hydrogen stations in the Megaregion.

Using the “Dig Once” Rule to Leverage Construction Projects

The Megaregion Working Group identified 12 priority projects critical to maintaining Northern California’s economic prosperity. Five of these projects are—or could be—leveraged to include ZEV fuel stations, thereby digging once for power, telecommunications, and roadway upgrades.

- 1. Valley Link Passenger Rail Buildout** - includes plans to produce hydrogen for transit and freight. ValleyLink is collaborating with Linde North America on the hydrogen production plant, and the Hydrogen Fuel Cell Partnership is confident that the industry will build an appropriate station nearby. The ValleyLink hydrogen production facility is part of the recent ARCHES Hydrogen Hub award from the U.S. Department of Energy.
- 2. Interstate-80 and U.S. 50 Yolo Express Lanes** - This project includes improvements to the surface streets and exit ramps in West Sacramento, improving access to the vacant land around the Port of West Sacramento. Yolo-Solano AQMD is working with the SSA Marine and the City of West Sacramento to plan a charging hub.
- 3. Highways 99/120 Interchange Reconfiguration** – charging for light-duty vehicles should be considered in the plan. The area around the interchange includes retail, restaurants, and neighborhoods and isn’t zoned for industrial. It does not meet the criteria for a truck ZEV station.
- 4. Central Valley Gateway** – will create a new off-ramp to connect industrial property in Tracy to I-580. A private developer intends to add a charging hub at the existing industrial park near this location.
- 5. Port of Oakland Portwide Electrification** – has existing charging stations in a pilot project that will be replaced and expanded in this project. Additional charging and hydrogen stations are being privately developed on land adjacent to or near the Port.

One Caltrans project, the **I-205/Mountain House Pkwy/International Pkwy Interchange** (District 10), is expected to start construction in 2024. The project will reconfigure the ramps from 205 to Mountain House Parkway/International Parkway to accommodate additional commercial traffic. This is an industrial area, and private developers have expressed interest in building a public charging station plaza here.

The **Regional Transit Network** is a collaborative effort between SACOG, transit operators, and planning agencies to improve the region’s public transportation services. After extensive engagement with operators and planning agencies, the project team developed a list of High-Capacity Transit (HCT) corridors through

a data-driven process finalized in May 2024.²⁸ HCT refers to faster, higher-volume transit services in busier, denser travel corridors. HCT services typically move more people faster and more efficiently than regular bus services and operate seven days a week from early morning until late night.²⁹ The project team identified locations in Yuba City, Vacaville, Dixon, and Stockton that could fuel transit buses and freight trucks.

On June 9, 2024, the Federal Transit Administration announced the FY24 FTA Bus and Low—and No-Emission Grant Awards, which included four Megaregion member agencies.³⁰ Three projects will add hydrogen stations, which may present an opportunity to share fueling with other agencies and trucks.



- City of Davis (Yolo County) \$1.6 million to construct infrastructure and buy charging equipment to support its battery-electric bus fleet
 - Alameda-Contra Costa Transit District (AC Transit) \$15 million to buy new hydrogen fuel cell buses to replace older diesel buses, expand existing hydrogen fueling facilities, and initiate a workforce development program.
 - Western Contra Costa Transit Authority \$20.6 million to buy hydrogen fuel cell buses to replace older diesel buses, expand its hydrogen fueling station and maintenance facilities, and initiate a workforce development program.
- Sacramento Regional Transit District will spend \$76.9 million to buy new hydrogen fuel cell buses to replace older buses, modernize a maintenance facility, and initiate a workforce development program.

Placer County Transportation Planning Agency (PCTPA) worked with Jacobs on a feasibility study in conjunction with the I-80/SR 65 interchange project. Jacobs assessed the viability of installing battery-electric truck charging stations and hydrogen refueling infrastructure to accommodate the increasing

²⁸ <https://www.sacog.org/planning/transportation/public-transportation/regional-transit-network-study>

²⁹ <https://assets.onboardsnv.com/wp-content/uploads/2019/10/19133628/On-Board-High-Capacity-Transit-Briefing-Book.pdf>

³⁰ <https://www.transit.dot.gov/funding/grants/fy24-fta-bus-and-low-and-no-emission-grant-awards>

number of medium- and heavy-duty trucks that use the interchange. The final report, completed in June 2024, evaluated five sites as ZEV stations and included a Request for Information solicitation and interview process to gather input from potential market interests. The five sites evaluated are shown in Figure 8.

Figure 8: Five Potential Sites for ZEV Fueling in Conjunction With the I-80/SR 65 Interchange Project.
(Source: PCTPA And Jacobs)



California, Washington, and Oregon are jointly applying for a 2024 CFI grant from the U.S. Department of Transportation. Applications are due to DOT in late August 2024. If awarded, Caltrans will issue a Request For Proposals for private developers to propose specific locations for MD/HD charging and hydrogen stations along I-5 between the borders of Mexico and Canada.

More than Math:

Locations Must Consider Business Operations

Many master plans and studies approach public charging and fueling as a math problem: battery size, range, and charging time. This plan took a human-centered approach to identify locations that could meet the operational needs of people and companies that drive trucks, build stations, and live or work near the truck stop of the future.

Hundreds of truck operators and drivers were interviewed for this study, and previous studies found that most MD/HD vehicle drivers need to refuel between the origin and destination. Zero-emission vehicles (ZEVs) have less fuel capacity and, therefore, less range and will likely need fuel during the driving shift. Table 7 compares the ranges of current ZEV trucks to conventionally fueled vehicles.

Interim Reports:
Summary of Stakeholder Interviews, Business Models for ZEV Fuels, Prevailing Terms and Conditions

Table 7: Comparison of the Range of Trucks on Conventional and ZEV Fuels. (Source: Frontier Energy)

Vehicle	Petroleum	Electricity	Hydrogen
Kenworth T680 [Semi]	750 miles	150 miles	450 miles
Ford E-450 Cutaway [box truck]	384 miles	105 miles	N/A
Freightliner MT50 [step van]	380 miles	150 miles	170 miles [prototype]

Battery electric trucks need 2-3 hours to recharge an empty battery at a 150kW DC fast charger.³³ Fuel cell electric trucks need about 20 minutes to refill with hydrogen. Recharging or refueling during a route will impact the driver's HOS and the operator's business costs.

³³ DCFC charging speeds may be as high as 1 megawatt. The project's steering team recommended using 150kW DCFC as a basis for calculations.

"I have 40 drivers, and if I have to pay them each for one hour of charging every day, that's like hiring five extra people. We'll have to pass that cost to customers, who will pass it on to consumers."

Quote from drayage operator during interviews

The project team interviewed 14 ZEV station developers who have built, plan to build, or want to develop ZEV fuel stations for trucks in California. Some are well-established companies with histories with other fuels and renewable power generation, while others are start-ups that see new opportunities. Only one of the station developers interviewed was familiar with the Sacramento area, and few had talked to trucking operators to understand regional needs.

Nearly all the station developers stated that they wanted to own the land and that the ideal property would be a paved lot or greenfield site in an area zoned as industrial. None wanted to buy an existing gas station, a property with a building, or a brownfield site that needed remediation.

The project team also talked to three companies that operate truck fueling stations. One, a company that owns travel plazas, is adding DCFC and considering hydrogen at locations statewide. Still, none of the locations are in the Megaregion due to complications with getting permits for expansion. The other two, a card lock station operator and an operator of private fuel depots, are not interested in adding ZEV fuels.

Putting people in trucks creates demand for charging infrastructure, which helps provide a reliable customer base and source of income for site developers. Zero-emission truck drivers need access to convenient charging stations and places to park trucks overnight, and ZEV infrastructure site developers need truckers to utilize the stations. Tying deployment of trucks to public charging and hydrogen refueling infrastructure – such as proposed in the TaaS model – reduces the risk of deploying under-utilized assets that deter potential investment. Developing a successful model connecting affordable access to zero-emission trucks and infrastructure will set the stage for replication across the state.

"Our business model calls for 10+ acres of land near highways. We will build an island for trucks and one for cars and expand as demand increases. We expect to lease land to other businesses."

Hydrogen station developer interview



Using Data and Interviews to Select Locations for Analysis

Using all the inputs from data, mapping, and interviews, the project team developed criteria to select and evaluate locations and then received feedback from the steering committee, stakeholders, and community members. In an iterative process, the team set the following minimum criteria:

Interim Report: Candidate Station Site Assessments

- Filled a gap between existing and planned stations
- Will have near-term customers from a baseload fleet or high-traffic distribution centers
- Within one mile from highway access of a freight route
- Undeveloped land or a paved parking lot with industrial or similar zoning
- Should not hurt residents and businesses and not require routing through residential areas
- Sufficient frontage for two driveways
- Sufficient space for a Class 8 tractor with a 40-foot trailer to maneuver

Secondary criteria included:

- Ability to leverage another project, which may include a highway improvement project
- May support transit operations, particularly as they relate to emergency evacuation routes
- The property is for sale, or the owner is known and can agree to station construction
- The utility can provide needed power in a reasonable time frame
- The site can provide personal and cargo safety to drivers

The team used GIS mapping to identify locations that met the physical characteristics, and an interactive survey tool, Social Pinpoint, was deployed so that people could nominate locations. The project team also worked with commercial real estate brokers to identify parcels for sale throughout the region. The team generated a list of more than 100 sites and then started the elimination process. Properties were removed from the evaluation list because they didn't meet multiple criteria and because:



- The property owner didn't respond, and the site was not crucial to filling a gap
- The site could not be made available to the public
- The site has long-term tenants who would be unlikely to agree to the project
- Input from utilities that meet the electrical load impact of between 2 and 10 MW would be cost-prohibitive³⁴

The 17 Locations that Met the Criteria

Using data and input from the stakeholders listed above, the project team identified 17 sites that closely met most criteria and began the detailed evaluation process. During the evaluation, two separate funding opportunities opened, and using the data that the project team collected, station developers submitted proposals for the sites. Six were awarded funding, and the project team continued to offer the developers support and information. The project team continued evaluating 11 sites listed in Table 8.

³⁴ Utilities included Lodi Electric, Roseville Electric, Liberty Utilities, Alameda Power, Hetch Hetchy Water and Power, Modesto Irrigation District, and Truckee Donner Public Utilities District in addition to SMUD and PG&E.

Table 8: 17 Locations that Met the Criteria for Megaregion ZEV Stations. (Source: Project Team)

Address	City	County	Corridor	Land
1001 Sutter Street	Yuba City	Sutter	Hwy 99	.61 acres, near baseload fleets
695-710 Spaans Drive	Galt	Sacramento	Hwy 99	4 acres on high-travel routes
15314 N. Thornton Road	Lodi	Sacramento	Hwy 99	5 acres on high-travel routes
1422-1510 Boeing Way	Stockton	San Joaquin	Hwy 99 and I-5	11 acres, on high-travel routes, near baseload fleets
8638 Sparling Lane	Dixon	Solano	I-80	Caltrans Maintenance station, large baseload fleet, critical facility during emergencies
2243 Cornelian Drive	South Lake Tahoe	El Dorado	Hwy 50	Caltrans maintenance station, critical facility during emergencies
41975 Nyack Road	Emigrant Gap	Placer	I-80	1 acre, unauthorized truck parking, chain station
8308 Pedrick Road	Dixon	Solano	I-80	10 acres, on high-travel routes, near baseload fleets
3151 South Highway 99	Stockton	San Joaquin	Hwy 99	3 acres, on high-travel routes, near baseload fleets
920 Performance Drive	Stockton	San Joaquin	Hwy 99 and I-5	8 acres, zoned for truck yard, on high-travel routes, near baseload fleets
20781 US HWY 50	South Lake Tahoe	El Dorado	Hwy 50	1 acre, only property on 50 that can be developed
I-80/505 Junction	Vacaville	Solano	I-80	Claimed by developer
Army Depot	Sacramento	Sacramento	Highway 50	Claimed by developer
Industrial Way	West Sacramento	Yolo	I-80/Hwy 50	Claimed by developer
Jack Tone Road	Ripon	San Joaquin	Highway 99	Claimed by developer
Richmond Parkway	Richmond	Contra Costa	I-80	Claimed by developer
Mariposa Road	Stockton	San Joaquin	Highway 99	Claimed by developer

“Selling” the Locations for Future Development

Using cues from commercial real estate brokers, the project team developed a “sales brochure” that combined all the information gathered, gleaned, researched, and projected into three pages. Each can be used by itself; together, they tell a complete story.

Interim Reports:
Grid Capacity Assessments,
Conceptual drawings

- Page 1 (shown in Figure 9) is the location highlighted with a map and information about the property. Local jurisdictions, utilities, and commercial brokers can use this page to attract attention to a site that has already been researched and vetted.
- Page 2 (shown in Figure 10) is the technical details and is designed for station developers and funders. It shows a conceptual layout for charging and hydrogen (explained below), a potential timeline for development, site improvements needed, and a forecast of potential nearby customers.
- Page 3 (shown in Figure 11) is the community-level details and is split into three sections: local agencies to engage during planning and development, business models that are most likely to succeed, the economic impact of ZEV fuel sales, and a summary of community engagement needed before design and during construction.

The project team created four conceptual drawings for ZEV stations: two for charging and two for hydrogen stations. For each fuel, the concept drawings included a small station for lots less than two acres and larger stations for lots larger than two acres. Using a “kit of parts” approach enabled the team to scale the number of fueling/charging islands and move the electrical equipment or hydrogen supply to the appropriate location. Each conceptual drawing assumed that charging stations would be 350kW dual-port DCFCs and that hydrogen would be delivered, not produced on site. The four drawings are in Figure 12.

Figure 9: Page 1 Shows the Sales Highlights of the Location. (Source: Project Team)

Stockton ZEV Fueling Site

ADDRESS

1422-1513 Boeing Way
Stockton, CA 95206

ZONING

Industrial

PROPERTY

14 acres (2 parcels)
Undeveloped land
Listed for sale

ACCESS TO

Highways 99 and 4, I-5

POTENTIAL USERS

2,509+ trucks
10+ distribution centers



Suitable for DCFC or hydrogen fueling
Adjacent to Stockton Metropolitan Airport
Easy access to Highway 99 and I-5



NORTHERN CALIFORNIA MEGAREGION ZERO-EMISSION MEDIUM- AND HEAVY-DUTY VEHICLE STUDY • PRIORITY LOCATION ASSESSMENT

1422-1513 BOEING WAY, STOCKTON, CA 95206

ADDRESS
1422-1513 Boeing Way
Stockton, CA 95206

COORDINATES
37.906507° N, 121.255485° S

FREEWAY
Highways 99 and 4, I-5

CATEGORY
Vacant land, for sale

SITE DESCRIPTION
The site is a vacant parcel within 2 miles of highway access

ZONING
Industrial

LOT SIZE
1422: 8.75 acres
1513: 5.48 acres

MEGAREGION WORKING GROUP MEMBER AGENCY
SICOG

ELECTRIC UTILITY
PG&E

REGIONAL MAP

POSSIBLE TECHNICAL SPECIFICATIONS

CHARGING INFRASTRUCTURE

- Up to 76 DCFC stations with 350 kW
- 76 pull-through stalls for medium- and heavy-duty EV charging (possibly more if only medium-duty vehicles)
- Total power supply needed: up to 13,300 kW

Conceptual Equipment Layout

Electric Grid Considerations

- Installing 38 dual-head DCFC stations with a total power output of 350 kW each, a ~15,000-sq-ft. convenience store with an estimated building load of 150 kW and providing appropriate site lighting result in a total estimated site load of 13.5 MW.
- Site voltage of 12,000 V with a service size of 1,200 A is recommended
- Available capacity:**
 - Local distribution circuit:** PG&E circuit load projections are not available for this site, ~0.4 MW of estimated available circuit capacity
 - Local substation bank:** PG&E substation bank loading projections are not available for this site, ~0 MW of estimated available capacity
- Utility upgrades:**
 - Necessary utility upgrades at this site expected to require at least 5 years
 - Developers with site loads exceeding 4 MW are advised to perform a preliminary load study with PG&E to understand cost and schedule of necessary upgrades
 - Line upgrade projects could be 18-24 months with budgets of \$2-5M
 - Substation upgrades could be 48-60 months with budgets of \$15-30M

or

H₂ REFUELING INFRASTRUCTURE

- Up to 4 H₂ refueling dispensers
- Dispensers placed in between pull-through stalls
- Location of hydrogen equipment (liquid/gaseous H₂ storage tanks, pumps, etc.) to be confirmed as part of station design process

Conceptual Equipment Layout

Hydrogen Considerations

- Hydrogen to be delivered and stored on-site
- Smaller power needs to support hydrogen fueling than electric truck charging

ACCESSIBILITY AND AMENITIES

ACCESSIBILITY

- Site is within 1 mi of access to I-5, within 2.5 mi of SR-99, and within 4 mi of SR-4.
- Frontage roads generally accessible to tractors with 40' trailers
- Site ingress/egress can be designed to meet the needs of heavy-duty trucks. Conceptual designs vetted for trucks with up to 4 axles and a single trailer

CURRENT AND POTENTIAL AMENITIES

- Existing: one restaurant within 10-min walking distance, street lighting
- Recommended: on-site convenience store (as shown in conceptual EV charging design) with restrooms, lighting, and Wi-Fi service

STATION NEEDS

PROJECTED ZEVS FOR GOODS MOVEMENT

The projected number of ZEV trucks for freight and goods movement in the Airport Industrial Park. This includes trucks that have terminals and visit businesses within five miles of the industrial park.

Projected Number of Resident and Daily Transient ZEV Trucks:

Year	Total ZEVS	BEVs	FCEVs
2023	~500	~100	~400
2024	~1000	~200	~800
2025	~2000	~400	~1600
2026	~3500	~700	~2800
2027	~5000	~1000	~4000
2028	~7000	~1500	~5500
2029	~9000	~2000	~7000
2030	~11000	~2500	~8500
2031	~13000	~3000	~10000
2032	~15000	~3500	~11500
2033	~17000	~4000	~13000
2034	~19000	~4500	~14500
2035	~21000	~5000	~16000
2036	~23000	~5500	~17500
2037	~25000	~6000	~19000
2038	~27000	~6500	~20500
2039	~29000	~7000	~22000
2040	~31000	~7500	~23500

Source: Frontier Energy

California's Advanced Clean Fleets (ACF) regulation applies to "priority fleets"—entities that operate or contract to operate 50 or more trucks in California or operator or contract to operate at least one truck and have gross revenues of \$50 million or more. Starting on January 1, 2024, 100% of trucks added to a priority fleet must be a zero-emission truck.

ACF also applies to government fleets and requires that 50% of medium- and heavy-duty vehicles added to the fleet during 2024-2026 are ZEVs and 100% are ZEV in 2027.

California's Advanced Clean Trucks regulation requires that truck manufacturers and dealers sell an increasing number of ZEVs each year.

The result of these two regulations, along with US EPA Heavy-Duty GHG Emission Standards, result in a rapid increase in the number of battery and fuel cell electric trucks starting in 2026. By 2035, all new trucks will require charging stations or hydrogen stations.

This is a growing industrial park with many distribution centers. Most trucks provide drayage between Ports of Stockton and Oakland, and the BNSF railyard, as well as distribute packaged goods to retail stores. Charging and/or hydrogen at this location could help drayage operators make the transition to ZEVS.

POTENTIAL USERS

USERS WITHIN 5 MILES	MHD VEHICLES
LONG-HAUL TRUCKING	859 trucks at 23+ companies
SRI SURGICAL EXPRESS STOCKTON	200 trucks
WILLIAMS TANK LINES	200 trucks
JM EAGLE	50 MHD vehicles
COASTAL PACIFIC FOOD DISTRIBUTION	100 MHD vehicles
C&S WHOLESALE GROCERS INC.	100 MHD vehicles
AMAZON	200 MHD vehicles

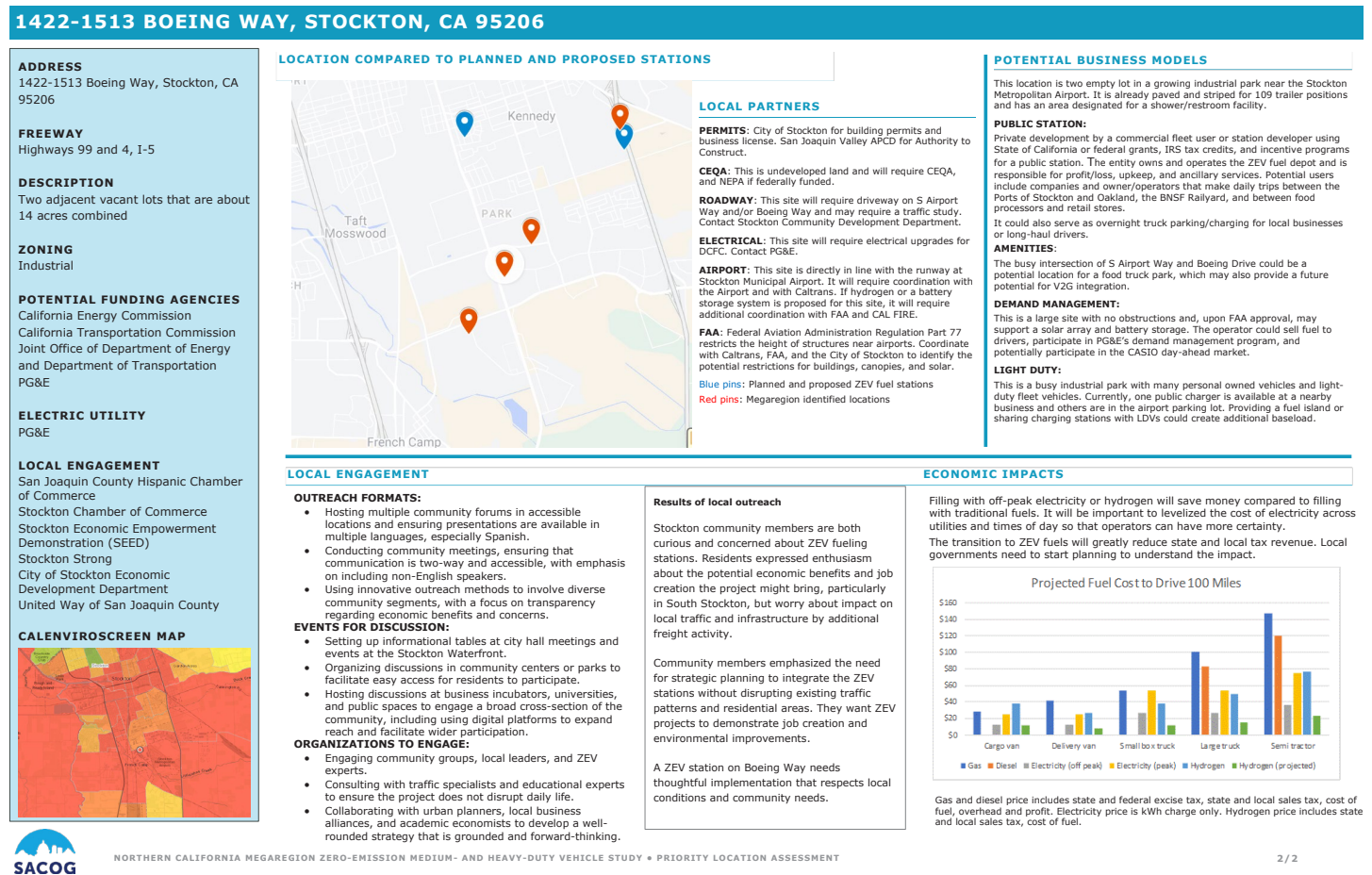
Source: Valgren Prosper Fleet

ESTIMATED DAILY VMT	WITHIN 1 MILE WITHIN 5 MILES OF SITE	
	OF SITE	OF SITE
TOTAL VMT	201,300	1,594,600
FREIGHT/TRUCK VMT	9,300	102,300
	4.6%	6.4%
FREIGHT/TRUCK VMT	900	26,800
65+ MILE TRIPS	8.6%	26.2%

Source: Replica

NORTHERN CALIFORNIA MEGAREGION ZERO-EMISSION MEDIUM- AND HEAVY-DUTY VEHICLE STUDY • PRIORITY LOCATION ASSESSMENT

Figure 11: Page 3 Informs Local Government About the Community and Financial Impacts. (Source: Project Team)



Appendix B shows the load calculations for the 11 sites. All 11 factsheet packages are in Appendix C.

Figure 12: Conceptual Layouts for Each Fact Sheet Using a “Kit-Of-Parts” Approach. (Source: Project Team)

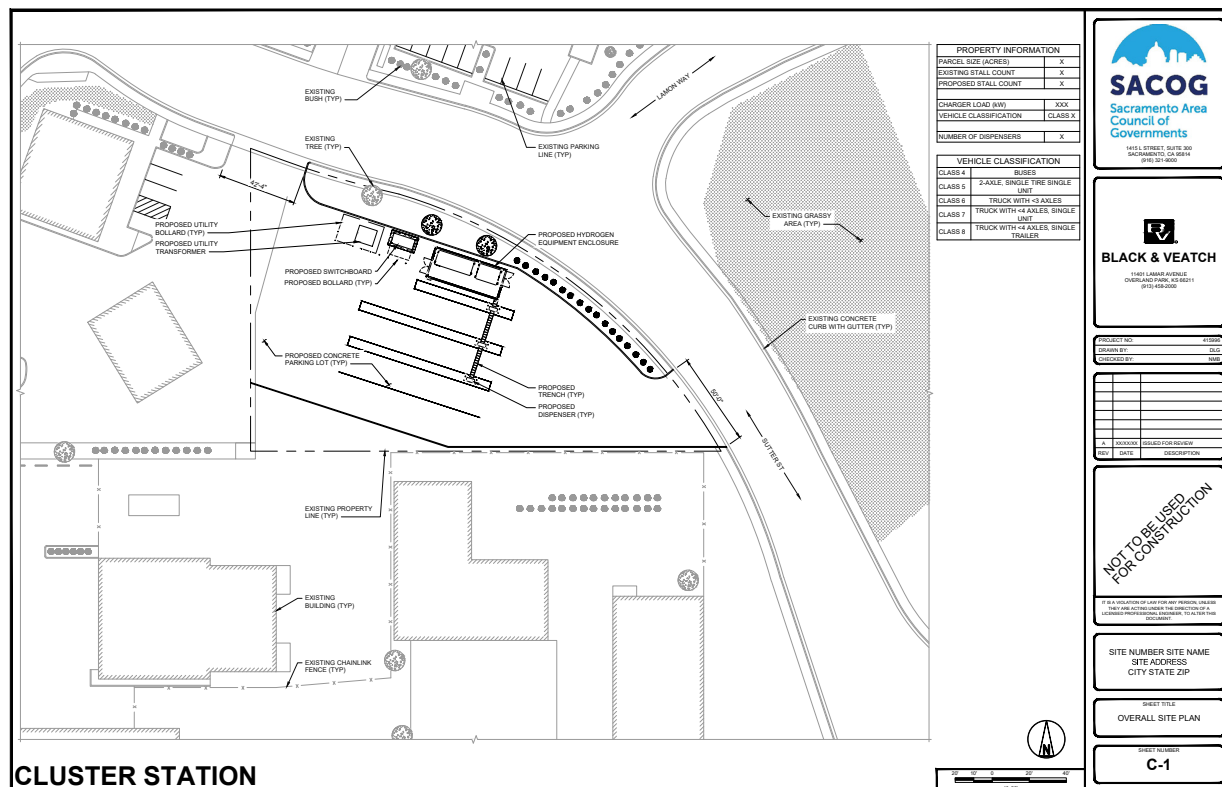
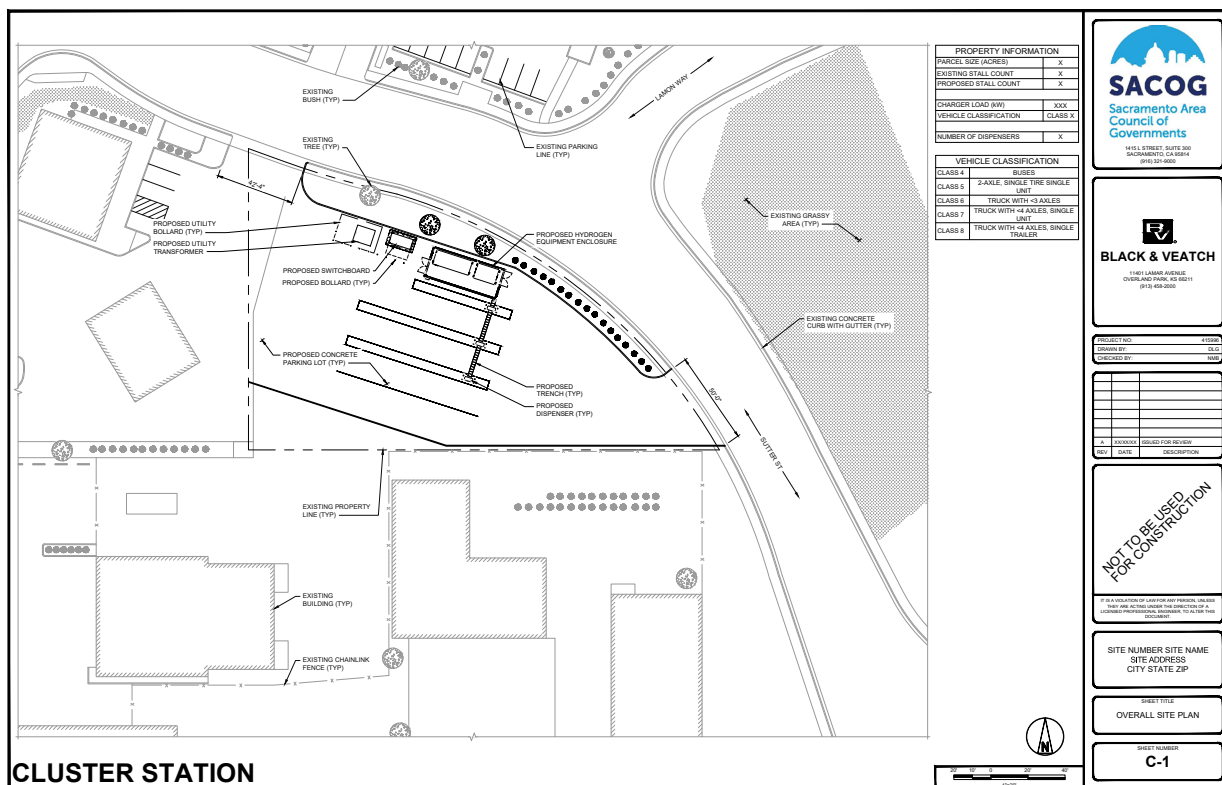
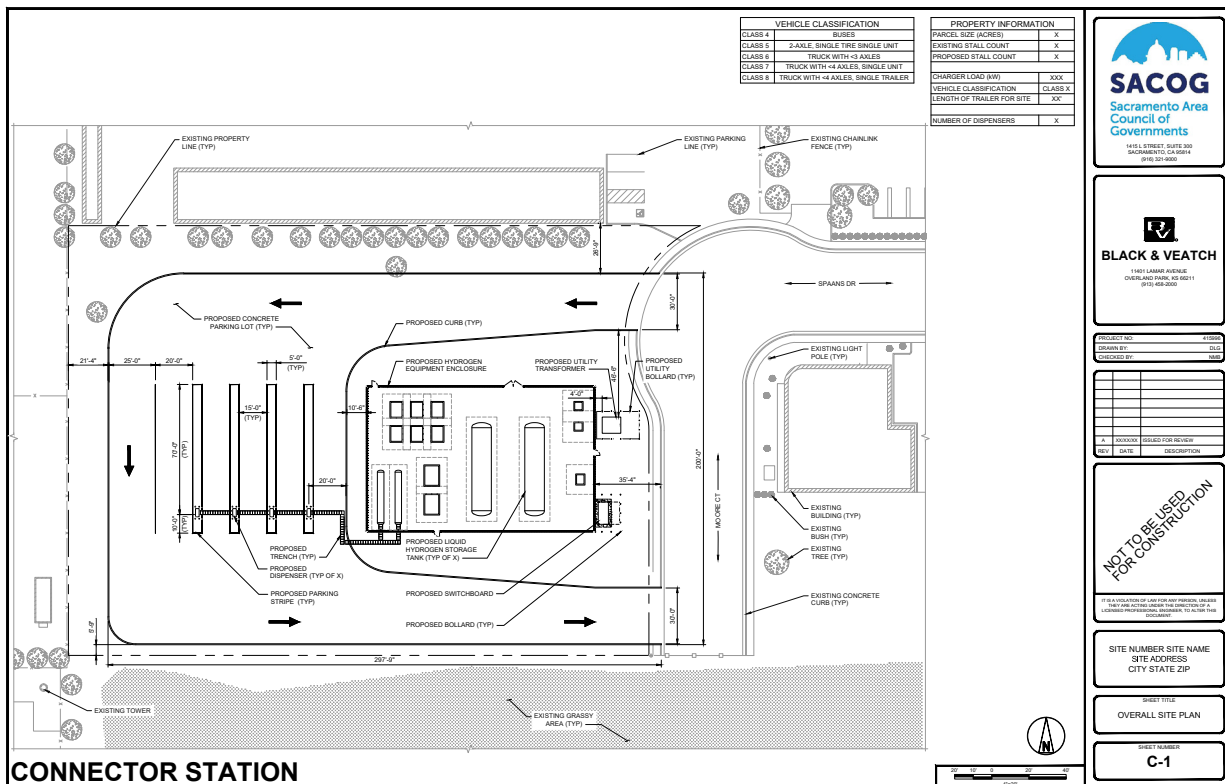
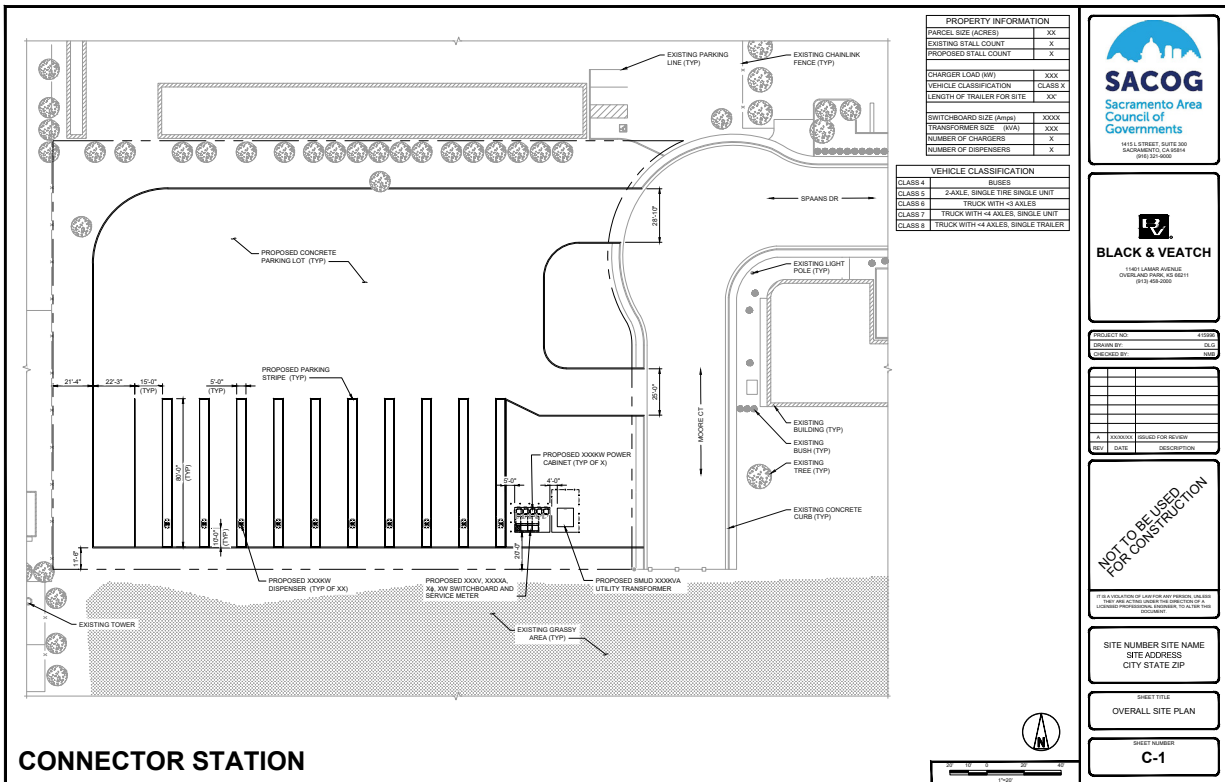


Figure 12: Conceptual Layouts for Each Fact Sheet Using a “Kit-Of-Parts” Approach. (Source: Project Team)



Opportunities for Government to Address ZEV Station Siting Challenges

During data research and interviews with steering committee members and stakeholders, the project team identified challenges unique to ZEV truck stations siting in particular areas but common throughout the Megaregion and statewide. Table 9 summarizes the challenges and opportunities. Table 9 summarizes the challenges and opportunities. The complete list of primary data and sources used for this report in Appendix D

Interim Report: Challenges and Opportunities

Table 9: Summary of the Challenges and Opportunities That Can Speed Up the Siting of ZEV Stations.

CHALLENGES THAT SLOW DOWN THE SITING OF ZEV STATIONS

1 THE VALLEY OF DEATH

The number of public plugs may be larger than the number of EV trucks in the early years, which may result in stations closing before sufficient trucks are in operation.

3 ADDING ZEV FUELS TO NEW INDUSTRIAL PARKS

Local zoning often requires building a structure on subdivided commercial and industrial land. ZEV station developers don't intend to develop structures and won't "gamble" on lots that need subdivision.

5 CO-LOCATING AT AIRPORTS

Regional airports have restrictions prohibiting structures that do not directly have aeronautical functions, which they believe prohibits building a ZEV fuel station on airport property.

7 COMPETITION WITH EMERGING TECHNOLOGIES

Regulations and sustainability goals also drive the electrification of ships docked at berth, freight and passenger rail locomotives, and airplanes. This will require additional investment and resources from public agencies, which must also electrify their fleets.

2 AVAILABILITY OF SUITABLE LAND

In many areas, undeveloped land is protected from development. Available parcels are zoned for agricultural, residential, or light commercial use. Industrial land is often prohibitively expensive to buy.

4 ADDING ZEV FUELS TO RE-ZONED INDUSTRIAL AREAS

In industrial areas rezoned to residential or mixed-use, existing businesses need a permit to install a truck charging station because it is a non-conforming use. Most local governments need to recognize that AB 970 applies to this situation.

6 ELECTRICAL CAPACITY

Charging stations need 2-10 MW of electricity for truck charging, which can take up to 10 years for a utility to provide. Ratepayers must subsidize overbuilt distribution infrastructure.

OPPORTUNITIES THAT CAN SPEED UP THE SITING OF ZEV STATIONS



1 RETHINK GOVERNMENT FUNDING

Air Districts might align Carl Moyer's Funding to encourage the use of public charging stations.

State and federal governments could issue employer tax credits for wages spent as hourly employees charge their trucks.



3 SURPLUS LAND

The state government could revise the Surplus Land Act to allow the development of mobility hubs for trucks and cars, similar to how cities can develop affordable housing.



5 CREATE A ZEV STATIONS AS AN ECONOMIC DEVELOPMENT TOOL

Cities and regions may use economic development tools to help create a ZEV fuel station away from the rezoned areas.



7 SPECIFY THE RELATIONSHIP WITH AIR CARGO AND TRUCKS

Caltrans Department of Aeronautics and the FAA could precisely identify the relationship between goods movement and cargo at airports and establish setbacks for truck charging stations from runways.



9 UNIVERSAL STANDARDS FOR MEGAWATT CHARGING

As standards develop for megawatt truck charging, it presents an opportunity to create a universal standard for connectors, power delivery, and metering for other vehicles, such as buses, aircraft, or other large battery electric vehicles with substantial battery packs and the ability to accept a >1MW charge rate.

The OpenADR Alliance was created to standardize, automate, and simplify Demand Response and Distributed Energy Resources.^B

2 ADD ZEV FUELS TO EXISTING STATIONS

Cities and counties can explore planning and permitting practices and fees to encourage existing stations to add ZEV fuels, which could decrease GHG emissions while supporting local businesses.



4 UPDATE THE MAP ACT

California Public Utilities Commission or legislation could create a categorical exemption similar to the existing exemption for solar fields and battery storage systems.



6 CLARIFY AB 970

GO-Biz could clearly articulate that AB 970 requires approval of charging station permits in existing buildings regardless of zoning.



8 ISLANDED MICROGRIDS

Public agencies can form JPAs to build and operate islanded microgrids for transportation using SB-1226 Joint powers agreements: zero-emission transportation systems or facilities.^A This could reduce the time and cost of utility upgrades.



^A https://leginfo.ca.gov/faces/billTextClient.xhtml?bill_id=202120220SB1226

^B <https://www.openadr.org/>

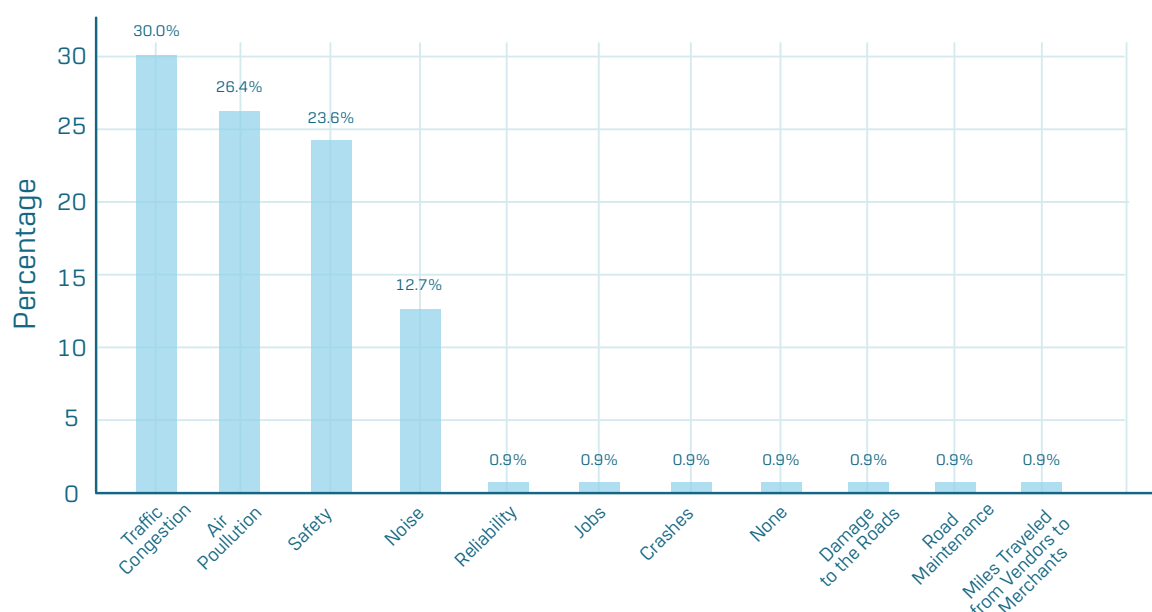
ZEV Trucks Stops and the Impacts on Community Members

To identify community concerns, value sustainability, and understand attitudes toward ZEV fuel facilities, the project team surveyed more than 100 community groups with diverse perspectives and their potential to influence sustainable transportation initiatives. The survey had 53 responses. The top concerns expressed in this preliminary outreach to communities are in Figure 13.

Interim Reports:
Community Survey on
Sustainable Freight
Transportation

In addition to survey responses, the team conducted a literature review of public comments about truck stops. One group, Community and Environmental Defense Services, summarized potential adverse effects of truck stops on nearby neighborhoods, including disturbing noise levels, property value decline, and increased possibility of crime.³⁵

Figure 13: Graph Showing Congestion, Pollution, and Safety as the Most Common Concerns. (Source: DIYSL Consulting)



³⁵ <https://ceds.org/truckstops/#:~:text=If%20gasoline%20will%20be%20sold,issues%2C%20and%20property%20value%20loss.>

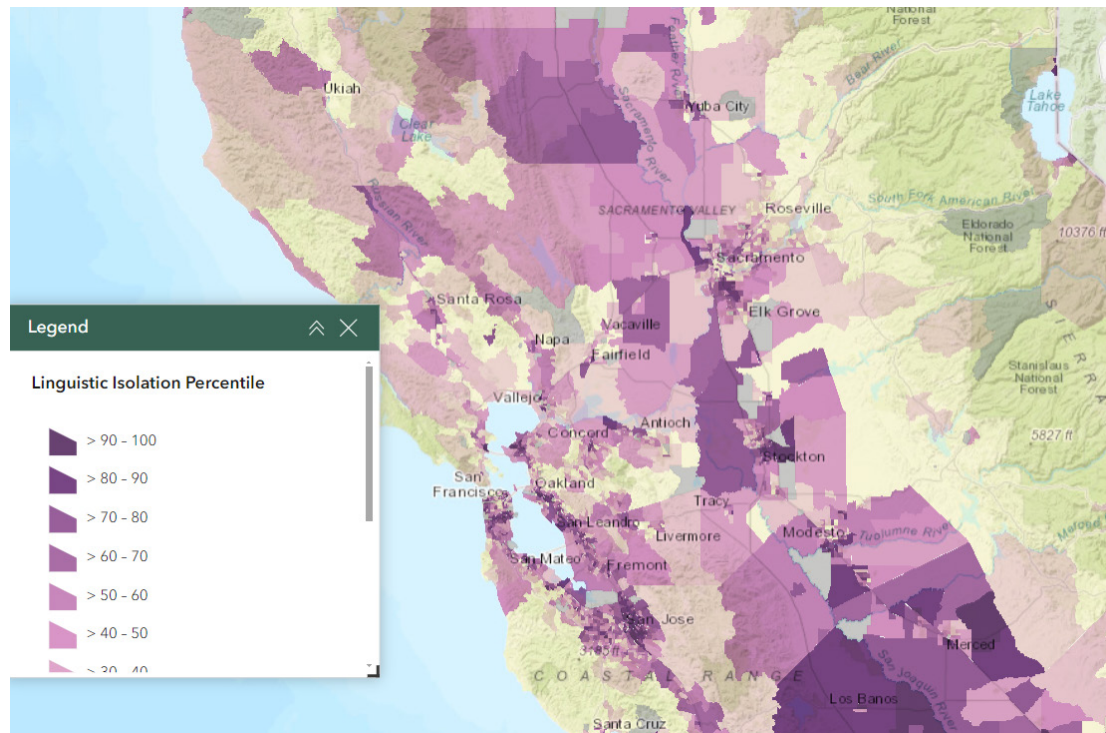
The project team acted on the concerns about traffic congestion and safety by using multiple sources of data to:

- Identify intersections and exits that are currently impacted by traffic
- Avoid residential and light commercial areas
- Avoid locations that might have “shortcuts” through residential areas

Driver Safety and Linguistic Isolation

Drivers and operators interviewed for the Megaregion also expressed concerns about safety, particularly women drivers and drivers for whom English is their second language. Figure 14 is a map from CalEnviroScreen that indicates linguistic isolation by census tract.³⁶ Throughout the region, many residents speak only Spanish. Other languages at home vary by region and include Asian languages (Mandarin, Korean, Cambodian, and Vietnamese), Filipino languages, Slavic languages (Russian, Ukrainian, Polish), and Indo-European languages (Iranian, Hindi, Punjabi).

Figure 14: Households Throughout the Region that Speak Only Languages Other Than English. (Source: CalEnviroScreen)

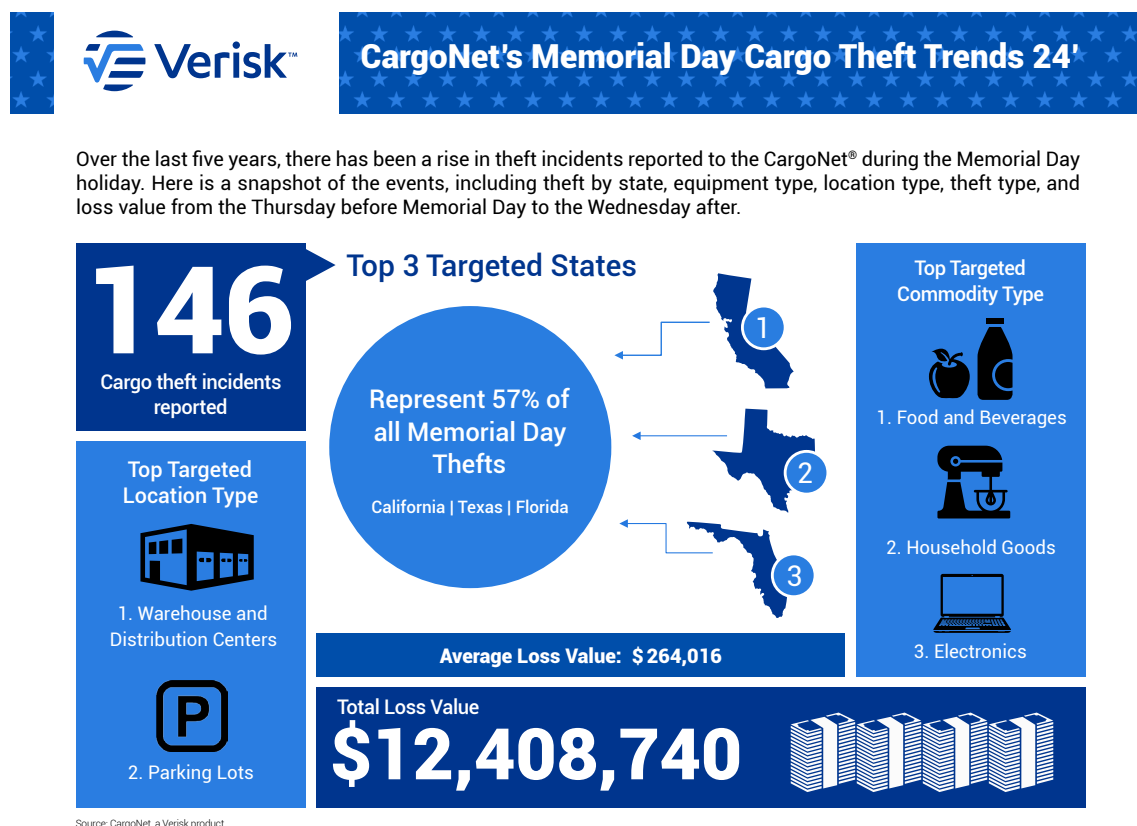


³⁶ <https://experience.arcgis.com/experience/ed5953d89038431dbf4f22ab9abfe40d/page/Indicators/?views=Linguistic-Isolation>

In 2022, FMCSA published the *Crime Prevention for Truckers Study* [7]³⁷ to understand the nature and prevalence of harassment and assaults against truckers. Harassment, in this study, is defined as the threat of harm or actual physical harm perpetrated against a trucker, their possessions, vehicle, or cargo. The study evaluated three trucker groups: 1) women, 2) minority men, and 3) non-minority men (control group). The study found that women truck drivers encounter sexual physical, verbal, and mental harassment, stalking and sexual assault, and theft of property. Black and Latino drivers are called racial slurs and inappropriate names and encounter extortion, physical assault, and theft of goods and property. Minority men reported that most of the incidents were at the workplace, while women reported that most incidents, particularly sexual assault, were at fueling stops, rest areas, and shipping docks.

CargoNet, a cargo theft prevention and recovery network, released an estimated \$223 million in cargo that was stolen across all theft events in 2022, and California had a 41% increase over 2021. Most theft is related to fraud and misdirection at the shipping dock and through software hacks, but parked trucks get stolen, particularly those loaded with food, household goods, and electronics. Figure 15 shows how, over Memorial Day weekend, 2023, 40 loaded trucks or trailers were stolen nationwide.³⁸

Figure 15: 2022 California Cargo Theft Data. (Source: CargoNet)



³⁷ https://www.fmcsa.dot.gov/sites/fmcsa.dot.gov/files/2022-11/FMC-R-220427-001-FMC-CC-001_MC-R%20CrimePreventionforTruckers_FinalReport.pdf

³⁸ <https://www.cargonet.com/siteassets/images/pdf/verisk-cargonet-memorial-day-theft-trends-infographic-2024.pdf?cn-website=>



As a result of this information, the project team identified locations and conceptual drawings that include lighting, security cameras, and visibility. Working with Women in Trucking³⁹ and other advocacy groups, the project team created a fact sheet with design recommendations for future truck stops.

³⁹ <https://www.womenintrucking.org/>



Equitable Engagement: Ensuring Community Members Are Heard

Freight is an equity issue beyond burning fossil fuels' health and environmental impacts. A study by WSP for the Chicago Department of Transportation noted that vulnerable communities are more likely to have high levels of truck traffic and freight facilities, and the community members feel their needs are ignored to reduce truck impacts on wealthier neighborhoods.⁴⁰

Interim Report:
Equitable
Engagement and
Implementation
Action Plan

The project team used guidance from both reports when selecting locations for ZEV stations and avoided sites within 1,000 feet of homes.

Through engagement with community members, the team tried to identify locations at which:

- Trucks would be less likely to drive on neighborhood streets to avoid congested intersections
- Landscaping could buffer the sounds of radios, drivers talking, horns honking, and other non-engine noises
- Trucks would not block driveways or cross streets to turn into the station
- A ZEV fuel station will not exacerbate a developing problem

⁴⁰ https://idot.illinois.gov/content/dam/soi/en/web/idot/documents/about-idot/events/2023-fall-planning-conference/1%20-%20Balancing%20Truck%20Access%20and%20Neighborhood%20Protection_McKenzie_Meyers.pdf

The Equitable Engagement Report and Implementation Action Plan outline a comprehensive approach to consider the diverse needs and voices of the communities within the Megaregion project area. Additionally, they summarize the outreach survey results and recommendations for implementing community engagement action plans for each potential project area. Equitable engagement followed the steps and actions outlined in Table 10.

Table 10: The Project Team's Process to Ensure Equitable Engagement. (Source: Project Team)



Insight gathered from engagement across communities can be summarized as follows:

- **Concerns About Traffic and Infrastructure.** Across all communities, there is a consistent concern about the potential increase in traffic and the strain on local infrastructure. Residents worry about congestion, safety, and the ability of existing roads and facilities to handle the additional load from the EV freight charging stations.
- **Need for Effective Planning and Management.** Respondents emphasize the importance of thorough and strategic planning to mitigate negative impacts. Suggestions include comprehensive traffic impact assessments, infrastructure enhancements, and careful site selection to minimize disruption to daily life and maintain community aesthetics.
- **Community Engagement and Communication.** There is a strong call for genuine and ongoing community engagement. Effective outreach methods include social media campaigns, public forums, town hall meetings, and partnerships with local organizations. Clear, transparent, and jargon-free communication ensures that residents are well-informed and can provide meaningful input.
- **Balancing Environmental Benefits and Community Needs.** While there is support for the environmental benefits of transitioning to cleaner transportation, communities stress the importance of balancing these benefits with local needs and interests. Ensuring that projects do not negatively impact the community's quality of life and preserving the local environment's character are common themes.
- **Economic Opportunities and Job Creation.** Many respondents recognize the potential economic benefits and job creation that such projects could bring. There is interest in leveraging these opportunities to support local economies, provided that the projects are implemented in ways that benefit rather than burden the communities.
- **Site-Specific Suggestions for Outreach and Engagement.** Each community has unique suggestions for outreach and engagement based on local contexts. Commonly recommended formats include social media, local events, and partnerships with civic and agricultural organizations. Specific events such as city council meetings, festivals, and community workshops are frequently mentioned as effective venues for discussion and engagement.

Overall, the feedback from these communities highlights the need for a well-balanced and community-centric approach to implementing EV freight charging stations, ensuring that environmental advancements are achieved in harmony with local interests and infrastructure capacities.

Throughout the project, the team coordinated with station developers to engage community members and created a fact sheet about community engagement that local government and developers can use during the design process. Fact sheets can be found in Appendix E.



Funding the Transition to ZEVs and ZEV Fuels: No Silver Bullet

In similar projects, team members have identified traditional and non-traditional funding and operational models for private and shared infrastructures. In 2016, Frontier Energy staff working for the California Fuel Cell Partnership proposed using LCFS credits as a market mechanism for hydrogen stations, which extended to charging stations.

Today, the project team considers funding and operation models, including public/private partnerships, incorporating microgrids and DER to participate in the CAISO's day-ahead electricity market, and leveraging disaster preparedness and response funding for transit resilience.

Local economies need to consider the financial impact as fuel sales tax diminishes. On October 1, 2022, AB 194 reduced the sales tax on diesel from 13% to 9% through September 30, 2023.⁴¹ Although only a one-year drop, it provides relevant data to forecast the county—and city-level impacts of reduced sales tax revenue.⁴² On a statewide basis, the Legislative Analyst's Office estimates a 31 % decrease in state transportation funding by 2035 due to a reduction in fuel excise taxes. Caltrans estimated a \$1.3 billion revenue shortfall by fiscal year 2028/29.⁴³

In 2023, the National Academies commissioned a study, Equity Impacts of Transportation Revenue Mechanisms and Changing Trends, to understand the impact of decreased sales and excise tax revenues on states, jurisdictions, and lower-income families.⁴⁴ The research is in progress, and the project team recommends that SACOG convene a workshop when the report is released to understand its impact on local revenue.

We anticipate that the final sites will serve varying needs and, therefore, require different approaches to funding and operational models. For example, the Four Agency MOU in the Sacramento area identified 600 zero-emission transit buses operating in the region, many providing

⁴¹ <https://www.iftach.org/bulletins/CA%20Special%20Notice%20L859.pdf> and <https://www.cdtfa.ca.gov/taxes-and-fees/sales-tax-rates-for-fuels.htm>

⁴² <https://lao.ca.gov/Publications/Report/4821>

⁴³ <https://catc.ca.gov/-/media/ctc-media/documents/programs/sb1121/sb1121-technical-workshop-022124-a11y.pdf>

⁴⁴ <https://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=5352>

long-distance commuter services. This number could increase as ACE rail service extends to Stockton. Shared charging/hydrogen stations for transit buses will require a different operational and funding model than a truck-as-a-service hub, such as the proposed location near the Sacramento International Airport. For each final location, the Frontier team will leverage the Private Partnership tools developed by the Caltrans Statewide Truck Parking Study and recommendations and ideas from the CEC-funded MD/HD blueprint projects. They will also recommend one or more business models to explore further.

Station Operators Have a Range of Business Models

- **Private Ownership** – An entity that owns and operates the ZEV fuel station and sells fuel by kilowatt (kW) or kilogram (kg). The entity is responsible for profit/loss, upkeep, and ancillary services.
- **Shared Ownership** – An entity owns and operates ZEV fuel dispensers on a property that a different entity owns. The ZEV operator may sell fuel by the kW or kg or charge a fee per use. The ZEV operator pays the property owner rent or splits fuel sales income. This is a standard model in today's gas stations for biofuels, hydrogen, natural gas, and charging stations.
- **As-a-Service Version 1** – A property owner provides land, and the ZEV operator owns and operates the fuel dispensers and may also provide ZEVs. The operator charges a flat monthly fee to subscribers for fuel, parking, and potentially other services. The landowner retains control of the land, provides risk insurance, and maintains the property. The ZEV operator is responsible for the equipment and liability insurance for the business operations. This is a standard model in today's fleet fueling stations. A government or private fleet owns the land, and a third party, like Hunt and Sons, operates the station.
- **As-a-Service Version 2** – A ZEV operator owns and operates a ZEV station and may provide EVs on privately owned land. The station is available only for the landowner's vehicles. The operator charges a flat monthly fee that covers capital and operating expenses. The landowner retains control of the land and provides risk insurance for it. The ZEV operator carries liability insurance for the business operations. This is similar to companies leasing vehicles and mobile fueling (wet hosing) from third parties.
- **As-a-Service Version 3** – An entity owns and operates an area for truck parking and adds charging stations as an amenity for overnight parking. Drivers pay a fee for the parking spot and, potentially, additional fees for energy use. The station may also have other services, like a driver's lounge, CAT scale, or food service, available for free or an additional fee. This is similar to how today's travel centers provide overnight parking for long-distance truck drivers.

- **Trucking as a Service (TaaS)** – a third-party developer develops, owns, and operates EV chargers, hydrogen dispensers, and electric trucks. The truck lease package may include low-cost/free charging or hydrogen refueling. The lessor funds the package with federal and state funding programs, fuel and maintenance savings, and Low Carbon Fuel Standard (LCFS) credits. The operational savings gained



by the lower cost of electricity compared to diesel are used by lessees to pay back the upfront capital. At the end of the lease period, Independent Owner Operators (IOOs) would have the option to extend the lease at a reduced rate, buy the vehicle at fair market value with the option to lease the parking space and extend their charging plan, or terminate the lease. This is a new model that WattEV is pioneering.

- **Demand Management/Energy Storage –**

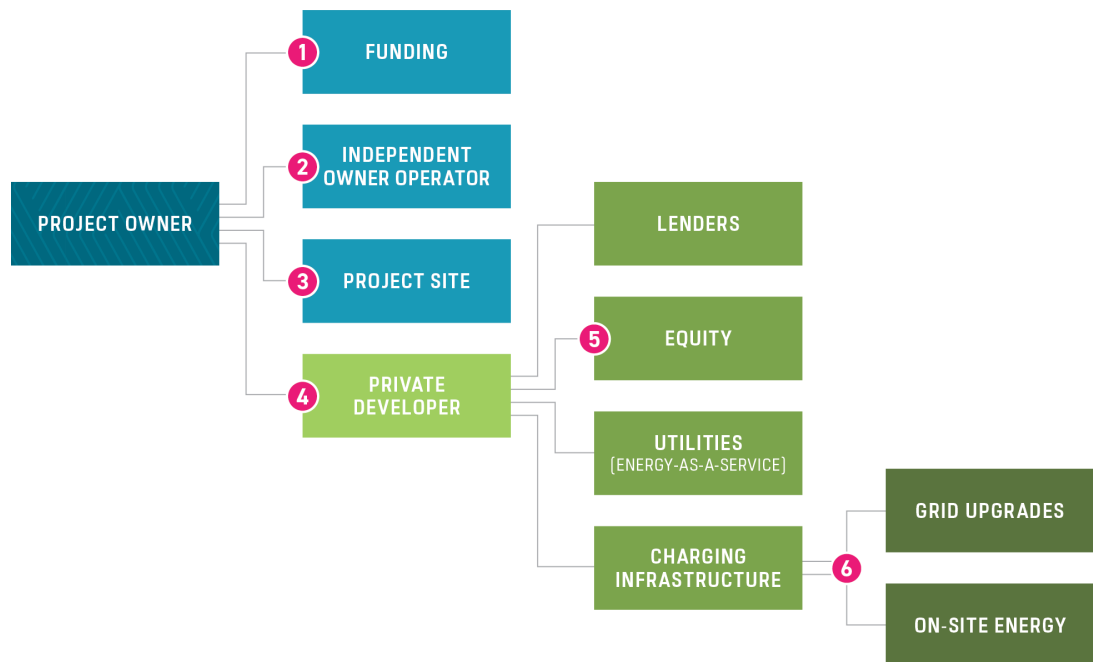
A utility, PPA, or hydrogen producer provides land, distributes energy resources, and owns and operates the ZEV station. The operator actively manages energy production, storage, and dispensing of electrons/hydrogen. In addition to selling fuel to drivers, the operator participates in demand management or the CASIO day-ahead market and derives income from banking power in the middle of the day and selling power during peak. This is a new model that traditional providers of utility-scale solar are pioneering.

- **Co-located Station –** A government, utility, or private entity builds a ZEV station on its land for its fleet, including offroad equipment, locomotives, ships, or aircraft. This is a new model that several counties and smaller ports are exploring, but have many unanswered questions about access, liability, and accepting payment at the station. The models being considered offer 24/7 access to the fleet and one of the following options to other vehicles:
 1. During certain hours, like the middle of the day when the fleet is gone, for a per-kWh fee.
 2. At dispensers “outside the fence” of the fleet yard for a per-kWh fee.
 3. To specific neighboring fleets that pay a monthly fee.

Customizing the Project Players and Pieces

The ZEV Infrastructure Delivery Diagram is shown in Figure 16. The diagram presents a map of the key players and project pieces that can be customized to deliver any ZEV infrastructure project. The related components of the ZEV infrastructure system (i.e., the chargers, grid upgrades, and on-site renewable energy production) may be procured as a bundled system by a single private developer or separately through multiple private developers. The table below is a key to the diagram.

Figure 16: ZEV Infrastructure Delivery Diagram (Source: Momentum).



- 1 The charging infrastructure owner should apply for funding opportunities to fund capital costs.
- 2 The independent owner operators will pay the project owner through chargers, which the project owner can use to pay back site development costs over time and cover the cost of dispensed energy.
- 3 The project site must be either owned or under a long-term lease.

- 4 The project owner may design, build, finance, operate, and maintain the charging infrastructure and related components as needed and determined by their risk appetite.
- 5 A combination of debt, equity, and utility [Energy-as-a-Service] financing may be used with public funding obtained to finance capital costs for the delivery of the site and charging infrastructure.
- 6 If necessary, as part of the design specifications, the project owners will work with the electric utility to identify any needed grid upgrades and potentially deploy on-site renewable energy and energy storage system resources.

Debt and equity investors and utilities offer third-party financing for Energy-as-a-Service (EaaS), which covers upfront capital costs. Power Purchase Agreements (PPAs) can also be utilized to deploy renewable energy and battery energy storage systems (BESS) on-site. The financing terms, such as the interest rate and the payback period, will inform market appetite.

When the project owner fully pays the capital expenditure, the upfront capital will be paid back to the project owner over time. The project owner will receive revenue from the charging stations' users through the electricity or fuel rate – plus LCFS credits – to cover the infrastructure cost and make a return on investment.

Some utilities provide upfront capital to finance grid improvements and microgrids in an EaaS model. Customers repay the utility's upfront capital investment over time through an increased energy rate for a specified period.

Prospective station owners can take two approaches: system bundling or independent asset procurement. System bundling is when the project owner has a lower risk appetite and is willing to pay a risk premium. Independent asset procurement is a model in which each identified service may be delivered and financed separately. The project owner should determine its risk appetite and commercial and operational limitations if independent asset procurement is considered. Table 11 and Table 12 compare the advantages and challenges of both approaches.

Table 11: Advantages and Challenges of System Bundling.

Advantages	Challenges
<ul style="list-style-type: none"> • Reduced interface risk between system elements 	<ul style="list-style-type: none"> • Few private players have full-service capabilities in the current market.
<ul style="list-style-type: none"> • The possibility that third-party financing is facilitated and terms of funding of improved 	<ul style="list-style-type: none"> • The possible risk premium for items that the project owner could handle in-house
<ul style="list-style-type: none"> • Easier access to financing for charging system providers due to ongoing relationships with debt and equity investors and EaaS providers. 	<ul style="list-style-type: none"> • Possible limitations on agencies to procure complete operations scope due to union arrangements or other contractual agreements
<ul style="list-style-type: none"> • Simplified contractual management by the agency 	

Table 12: Advantages and Challenges of Independent Asset Procurement.

Advantages	Challenges
<ul style="list-style-type: none">• Allows the project owner to work around commercial and operational limitations and to remain compliant with contractual agreements <hr/> <ul style="list-style-type: none">• Possibility to accelerate delivery of discrete elements of the system that may be more critical	<ul style="list-style-type: none">• The project owner retains the integration risk of independent elements: if elements are delayed, the project owner must manage the challenges of schedule impacts and cost overruns. <hr/> <ul style="list-style-type: none">• Increases in project owner’s project management and counterparty coordination responsibilities



Using the Theory of Change to Show Progress

The project team used a Theory of Change framework to identify the long-term goal, the actions needed to reach it, and interim “outcomes” that individuals, groups, and local governments can use to gauge changes in behavior and attitudes.

Many plans use key performance indicators (KPIs) to compare performance to goals. KPIs are helpful when an entity has specific targets and defined methods of collecting data that it can evaluate to identify trends and patterns. KPIs are optimal when compared against targets, objectives, or industry peers, for example, reducing energy consumption by 10% or increasing transit ridership year over year.

The Theory of Change (ToC) describes strategies, actions, conditions, and resources that can facilitate change. It helps establish a shared vision and methods of evaluating progress toward a long-term goal. It can also identify gaps in data, prioritize data collection, and provide a structure for data analysis and reporting. The complete framework follows.

PROBLEM STATEMENT

ZEVs and stations are new and unproven technologies. Infrastructure is a significant barrier to ZEV truck adoption. Trucks need access to affordable charging and hydrogen stations at key locations in North Central California.



GOAL

The transition to ZEVs for freight and goods movement is a reality. The Megaregion will meet the goal of 100% zero-emission transportation by 2045.

Setting the Starting Point and Measuring Change

Inputs are facts or actions that are the starting point for change. In this study, all participants accept that:

- The project resulted in 17 locations for charging and hydrogen stations in 15 counties. Private developers intend to put a ZEV station at six sites; the other 11 are available and suitable for development.
- About 28 public ZEV truck stations are funded for planning, construction, or operation in the Megaregion.
- Advanced Clean Fleets and Advanced Clean Trucks regulations and other state and federal regulations aimed at GHG reduction are in place and driving the sales and purchase of ZEV trucks.


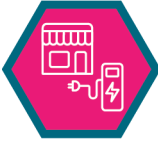

Outputs are the visible changes that can be tracked and measured. Each output has a different target date, which may change based on activities. Additionally, the date an outcome is achieved could vary by county or census tract. Regionwide outputs are:

- By 2045, 100% of the trucks domicile and operate in the Megaregion of ZEVs.
- In 2035, at least 80% of the ZEV stations that are planned, funded, and in construction are open and operational.
- By 2030, existing truck fuel stations will see a business case and have a permitting pathway to add ZEV fuels.
- By 2028, all new industrial parks will include a ZEV fueling hub
- By 2027, at least 75% of the locations identified in the Megaregion, or very close to an identified location, are funded or in planning.

The Action Plan

Activities are defined as events that need to happen to achieve the outputs. The project team and steering committee believe that private developers will continue to plan and build ZEV stations and that state and local governments should create a policy and economic environment that attracts development. Table 13 summarizes activities, entities activities are assigned to, and recommendations.

Table 13: Activities That Need to Occur, How They Can Occur, and Who Might Facilitate Them. (Source: Project Team)

ACTIVITIES:	WHAT TO DO:	WHO SHOULD DO IT:
 OFFER GRANTS AND INCENTIVES FOR ZEVs AND STATIONS	Continue existing funding programs to close the gap between conventional vehicles and fuels and ZEVs.	FEDERAL GOVERNMENT, STATE GOVERNMENT, UTILITIES
	Consider grants and rebates that encourage ZEVs to use public stations.	COUNCILS OF GOVERNMENT AND AIR DISTRICTS
	Consider a tax credit modeled on the Work Opportunity Tax Credit, which gives an employer a tax credit for wages paid for an employee to charge a truck.	STATE AND FEDERAL GOVERNMENT
 CHARGING STATIONS ALLOWED AT EXISTING BUSINESSES	Articulate to local permitting and planning departments and planning commissions that AB 970 allows charging stations at any business regardless of zoning changes.	GO-BIZ
 COST REDUCTION FOR GREEN HYDROGEN	Reduce the cost of delivering hydrogen to the ARCHES target of \$3/kg.	HYDROGEN PRODUCERS, UTILITIES, ARCHES HYDROGEN HUB

ACTIVITIES:**GRID SUPPORT
FOR MEGAWATTS
OF CHARGING****WHAT TO DO:**

Working with the U.S. Department of Commerce, provide incentives for local production of electrical equipment to reduce the years-long wait for transformers, switchgear, and other components.

Using the U.S. DOE's 2023 Critical Materials Assessment,^A identify opportunities for California businesses and natural resources to supply raw materials needed to build electrical components.

Reduce the regulatory barriers for islanded microgrids at ZEV fuel stations.

Consider how EPIC funding could be shared with small municipal utilities to support electric generation, transmission, and distribution for ZEV fueling stations.

Reduce the barriers to submitting and implementing a GRIP grant for small municipal utilities and cooperatives.^B

Report the outcomes of DERMS and other pilot projects to manage power needs between buildings and vehicles.

WHO SHOULD DO IT:**FEDERAL GOVERNMENT****FEDERAL AND
STATE GOVERNMENT****UTILITIES, CALIFORNIA
PUBLIC UTILITIES
COMMISSION****ENERGY COMMISSION****U.S. DEPARTMENT
OF ENERGY****LARGE UTILITIES**

^A <https://www.energy.gov/cmm/what-are-critical-materials-and-critical-minerals>

^B <https://www.energy.gov/gdo/grid-resilience-and-innovation-partnerships-grip-program>

ACTIVITIES:**REGULATIONS
CONTINUE TO
SUPPORT ZEVS****WHAT TO DO:**

Continue with regulations that are technology-neutral and require-emphasize ZEVS.

Agreement on the maximum weight rating for a ZEV truck, including those used to transport livestock.

Agreement on highway safety standards for heavier trucks, including ramps, guardrails, and barriers.

Agreement about fees and taxes to understand the impact on state and local revenue and identify methods of recouping lost revenue while encouraging ZEV fuels

WHO SHOULD DO IT:

**AIR RESOURCES BOARD,
U.S. ENVIRONMENTAL
PROTECTION AGENCY**

**U.S. DEPARTMENT OF
TRANSPORTATION,
CALIFORNIA DEPARTMENT
OF TRANSPORTATION**

**U.S. DEPARTMENT OF
TRANSPORTATION,
CALIFORNIA DEPARTMENT
OF TRANSPORTATION,
AMERICAN ASSOCIATION
OF STATE HIGHWAY
AND TRANSPORTATION
OFFICIALS**

**FEDERAL, STATE, AND
LOCAL GOVERNMENT**

**TRUCK
CHARGING
STANDARDS
ARE SET
AND ADOPTED**

Publish and maintain open standards for demand management, megawatt charging, hydrogen fueling, and communication that all ZEVS and stations can use without licenses, fees, or IP agreements.

Collaborate with the groups developing rail, aircraft, and marine standards so that connectors, nozzles, demand management, and communications are coordinated and compatible.

**MANUFACTURERS,
STANDARDS DEVELOPMENT
ORGANIZATIONS,
STATE GOVERNMENT**

**COST REDUCTION
FOR GREEN
HYDROGEN**

Revise or create a code for ZEV fuel stations similar to local codes for service stations (or similar), which includes design standards, impact fees, and allowable ancillary activities (e.g., sale of alcohol).

Determine the number of charging ports or hydrogen stations an existing business can add before triggering the service station code.

Revise or create standards, which may include "health, safety, peace, morals, comfort, and welfare," to help protect the community and drivers from the unintended consequences of ZEV stations.

**LOCAL GOVERNMENT,
GO-BIZ**

LOCAL GOVERNMENT

Outcomes

Outcomes are changes we can see and measure over time and may be challenging to track through metrics. Some may be anecdotal, and responses to surveys or themes in conference presentations may represent others. The project team, with input from the steering committee, created short-term, mid-term, and long-term outcomes:

By 2030: ZEV Trucks Will Be Operationally Effective for Short-Haul

Enough businesses will be driving ZEV trucks to show that they are operationally effective for drayage, short-haul freight, and agricultural freight. “Operationally effective” will mean different things to different businesses and can be measured by surveys and focus groups. Engaging with local chambers of commerce and business associations and monitoring grant reporting can measure changes that may include:

- Ability to complete a route using a ZEV fuel
- Ability to get reasonably priced ZEV fuel when and where it’s needed
- Minimum disruption to business operations
- Minimum impact on staffing levels/hours of service
- Vehicle and fuel station reliability
- A base load of customers at the station
- Ability for utilities and hydrogen producers to meet customer fuel demand
- Line of sight to profitability

During this period, we expect to see changes in attitudes about ZEV trucks and ZEV fuels from community members who worry about noise, road congestion, and safety, from drivers who worry about range and payload, and from local government agencies who are confused about permitting and zoning.

By 2035: The Business Models for ZEV Stations Will Consolidate

Many businesses will be driving or using ZEV trucks. The business models for ZEV stations will be consolidated into those most effective for customers and station operators. Data show that operational savings on fuel, maintenance, and potential worker injuries justify the higher costs of the ZEV truck. Data also quantify the liability risk of a ZEV station.

During this period, we expect to see changes that can be measured by surveys and data from ZEV sales and registrations, station use and hydrogen production, and station development speed.

Changes will include:

- There are more makes and models of ZEV trucks available, more significant configurations of trucks (e.g., tractors that can pull livestock trailers), and potentially greater range and heavier payloads.
- Local agencies can issue permits more quickly because they have design standards, impact fees, zoning codes, and processes for design review and building inspections.
- Communities see clear benefits from ZEV trucks with reduced noise, less dirt from criteria pollutants, and less congestion due to trucks' faster acceleration. Some areas may also see decreased health impacts related to diesel exhaust emissions.
- Federal, state, local, and utility incentives for ZEVs and stations taper off.
- Stations built behind the fence for the local fleet have enough operational experience to understand their fuel demand and the liability risk. They open the ZEV stations to selected fleets, transit agencies, or the general public.
- A clear plan exists to renovate or rebuild exit ramps, truck lanes, guardrails, barriers, rest areas, and other highway-related infrastructure to accommodate ZEV trucks.

By 2040: The Business Case for ZEV Stations Will be Clear and Effective

Most trucks on the road will be ZEVs. Hydrogen and electricity will have clear business cases and may fuel trucks with different use cases. The business proposition for ZEV trucks is clear for goods movement businesses and for ZEV station operators. Autonomous trucks may be emerging or in wide operation. During this period, we expect to see changes that can be measured by vehicle registrations, sales tax data from ZEV stations, and air quality sensors throughout the Megaregion. Changes will include:

- The percentage of ZEV trucks operating in the Megaregion meets or exceeds targets set by the State of California, port operators, Air Districts, and Council of Governments.
- Replica data shows that the number of ZEV miles exceeds the number of diesel miles.
- County assessor data shows the number of ZEV fuel stations and the zoned parcels for ZEV fuels.
- Taxation of ZEVs and ZEV fuels is equitable for drivers and for government agencies that depend on taxes and fees related to petroleum sales and combustion vehicle inspections.
- Measurable reductions in GHG emissions and criteria pollutants compared to same-date readings in 2024.





Conclusion

The Northern California Megaregion Zero Emission Medium- and Heavy-Duty Vehicle Study provides a strategic and comprehensive roadmap to transition medium- and heavy-duty vehicles to zero-emission technologies. This plan addresses the critical infrastructure development needs, regulatory alignment, community engagement, and funding mechanisms essential for successful implementation. This project's key findings and recommendations form a robust foundation for local agencies and the State of California to support the private development of ZEV stations in Northern California.

The Study will position the region as a leader in sustainable transportation. By addressing infrastructure needs, fostering community engagement, securing funding, and implementing practical business models, Northern California cities and counties can ensure a successful transition to zero-emission vehicles, significantly improving air quality and public health in the region while meeting California's ambitious climate goals.

Appendices

Appendix A: Current and Planned ZEV Stations

The California Energy Commission publishes and regularly updates a map of MD/HD public charging (orange squares) and hydrogen stations (green squares) funded through state and federal incentive and grant programs.⁴⁵ It's important to note that stations sometimes change locations between award and construction. Figure 18 maps the location of stations. Orange squares indicate charging, and green squares indicate hydrogen.

*Figure 18: The Locations of MD/HD Public ZEV Stations That Have Been Funded by the State of California Grants.
(Source: California Energy Commission)*



⁴⁵ <https://experience.arcgis.com/experience/f951c1433f804daea7f4c33c271aa935/>

Table 14 lists the ZEV stations outlined in the CEC map and additional stations proposed, planned, and funded by transit agencies, air districts, utilities, and private investment. Operators expect the “planned” stations to be operational between 2025 and 2028. The “proposed” stations do not have timelines yet.

This list excludes businesses planning or building private ZEV stations for their fleets. Other station developers may have ZEV stations planned and proposed in the Megaregion but have yet to share the information with the project team. The Energize program will continue to award new locations throughout 2024.

Table 14: Grant-Funded ZEV Stations and Additional Stations Proposed, Planned, and Funded By Transit Agencies, Air Districts, Utilities, and Private Investment. (Source: Project Team)

City	Description	Corridor	Approx. Address	#EVSE or Dispensers	Status
Sacramento	GiddyUp truck and bus charging stations	Hwy 50	3900 Power Inn Road	2	Operational
Sacramento	Truck charging station		Army Depot	5-7	Planned
Sacramento	Truck charging station	I-5/I-80	Northgate	5-7	Planned
Sacramento	Truck/bus charging stations	I-80	Mather Commerce Park	4	Planned
Sacramento	Truck hydrogen station	Hwy 99	Florin Road	2	Planned
Sacramento	WattEV Charging Hub	I-5	Metro Air Park	108	In design
Sacramento	Nikola hydrogen station	I-5	Metro Air Park	4	Planned
Sacramento	Nikola hydrogen station	Hwy 50	McClellan Business Park	4	Planned
West Sacramento	Truck hydrogen station	I-80 & Hwy 50	Industrial Blvd	2	Planned
West Sacramento	Truck charging station	I-80 & Hwy 50	Port of West Sacramento	Unk	Proposed
Roseville	PCTPA truck/bus charging hub	I-80	Highway 65 junction	10	Proposed
Galt	Nikola hydrogen station	Hwy 99	Amador Ave	2	Planned
Lodi	Lodi Energy Center hydrogen station	I-5	Thornton Rd	Unk	Proposed

City	Description	Corridor	Approx. Address	#EVSE or Dispensers	Status
Vacaville	Truck charging station	I-80	I-505 junction	10	Planned
Dixon	Truck charging stations	I-80	Pedrick Road	2	Planned
Oakland	Truck charging depot	I-880	Hegenberger Road	15	Planned
Oakland	First Element hydrogen station	I-880	Port of Oakland	4	Operational
Oakland	Truck charging station	I-880	Coliseum Way	2	Planned
Richmond	Truck charging station		Richmond Parkway	Unk	Planned
Livermore	Forum Mobility Greenville Community Charging Depot	I-580	National Drive	45	In design
Livermore	Hydrogen station	I-580	National Drive	2	Planned
San Joaquin County	Valley Rail hydrogen station	I-5	TBD	Unk	Proposed
Stockton	Truck charging station	Hwy 99	E Eleventh St	3	Planned
Stockton	Truck charging plaza	Hwy 99	Industrial Park	2	Planned
Stockton	Truck charging station	I-5	Near Industrial Drive	12-15	Planned
Tracy	Truck charging plaza	I-205/I-80	Industrial Park	25	Planned
Ripon	Travel plaza with charging for cars and trucks	Hwy 99	Jack Tone Road	Unk	Planned
Dunnigan	Travel plaza with charging and H2 for cars and trucks	I-5	At exit	Unk	Proposed

The California Energy Commission issued a Notice of Proposed Award for its CRITICAL PATHS funding opportunity in June 2024.⁴⁶ When awarded, these two grants will provide additional charging locations in the Megaregion:

- WattEV Connecting California's Corridors (3C) Project that will build stations on I-5
- Prologis Clean Freight Refueling Hubs that will build stations at Prologis' industrial parks in the Bay Area and Tracy

⁴⁶ <https://www.energy.ca.gov/solicitations/2023-09/gfo-23-602-charging-and-refueling-infrastructure-transport-california>

Appendix B:

Site Load Analysis

To calculate the potential load at each site, the team used the following parameters:

- The square footage of the parking area, less the space required for non-charging activities (drive aisle, landscaping, electrical equipment, buildings, etc.)
- The number and types of charging stations that can fit in the parking lot, less the square footage of the charging station islands or pedestal and ingress, egress, and buffer space as required in California Building Code
- Charger power consumption in kW and each charger is 306kW
- Dynamic system voltage parameter based on utility delivery (e.g., 480V, 1kV)
- Default delivery voltage is 277/480V service
- Static load for lights, security systems, and other non-charging-related uses (including shore power and charging for Transportation Refrigeration Units) with an 80% rated 400A service
 - » At larger sites, the team also assumed load for a 15,000 sq. ft. convenience store

Table 15: Load Calculations for Each of the 11 Sites Analyzed. (Source: Black & Veatch)

Site Info						EV Load					Amenities Load					Electrical Spec	
#	Street	City	Site Acreage	Site SqFt		A			B	C=A+B			D	E	F=C+D+E	Site Voltage	Service Size
						Load of Chargers (kW)	# of Truck Spaces	# of Charging Ports	# of Chargers	Est. Site EV Load (kW)	Building Type	Bldg SqFt	Est Bldg Load (kW)	Site Lighting (kW)	Total Est. Site Load (kW)		
2	1001 Sutter St	Yuba City	0.52	22,651	cluster	350	4	4	2	700	convenience	-	0	2	702	480	1,200
7	695-710 Spaans Dr	Galt	1.52	66,211	connector	350	10	10	5	1,750	convenience	-	0	7	1,757	480	3,000
9	Thornton Rd @ CA 12	Lodi	4.96	216,058	connector	350	36	36	18	6,300	convenience	15,000	150	22	6,472	12,000	1,200
12	1422-1510 Boeing Wy	Stockton	12.42	541,015	connector	350	76	76	38	13,300	convenience	15,000	150	54	13,504	12,000	1,200
15	8638 Sparling Ln Caltrans	Dixon	3.39	147,668	connector	350	2	2	1	350	convenience	15,000	150	15	515	480	800
19	2243 Cornelian Dr Caltrans	S Lake Tahoe	10.7	466,092	destination	350	2	2	1	350	convenience	-	0	47	397	480	1,200
26	41975 Nyack Rd	Emigrant Gap	2.3	100,188	destination	350	6	6	3	1,050	convenience	-	0	10	1,060	480	2,000
46	9308 Pedrick Rd	Dixon	16.6	723,096	connector	350	6	5	3	1,050	convenience	15,000	150	72	1,272	480	2,000
48	3151 SHwy 99	Stockton	6.68	290,981	connector	350	20	20	10	3,500	convenience	-	0	29	3,529	480	2@3,000
49	920 Performance Dr	Stockton	3.85	167,706	connector	350	26	26	13	4,550	convenience	15,000	150	17	4,717	480	2@4,000, 1@400
50	20781 US Hwy 50	S Lake Tahoe	2.36	102,802	connector	350	6	6	3	1,050	convenience	5,000	50	10	1,110	480	2,000

Appendix C:

Factsheets

In 2023 and 2024, most truck charging and hydrogen stations will be privately developed using a combination of state incentives, federal grants, income tax credits, Low Carbon Fuel Standard credits, utility incentives, community choice energy funding, and private investment. Many developers look at Replica data for daily truck traffic and the cost of available land.

The project team determined that the best approach to encouraging developers to build in the Megaregion was to create documents that resemble a real estate sales brochure rather than a traditional fact sheet. The pages are designed to be delivered as a package or stand-alone.

- Page 1 is the cover sheet with the basic facts and a summary of the selling features.
- Page 2 has technical information, the conceptual layout for charging and hydrogen, present and needed amenities, and a summary of potential site and roadway improvements. It also has information about potential baseload fleets and freight vehicle miles traveled.
- Page 3 combines information about local community engagement conducted and recommended and potential business models for ZEV stations and local agencies to engage for permits and planning. A table compares the cost of charging and hydrogen with the local price of gas and diesel to show potential fleet users how much ZEV fuel costs to drive 100 miles.

Yuba City ZEV Fueling Site

ADDRESS

1001 Sutter St,
Yuba City, CA 95991

ZONING

Industrial/Heavy Commercial

PROPERTY

0.61 acres
Undeveloped land
Listed for sale

ACCESS TO

Highways 99, 20, 70

POTENTIAL USERS

1,184+ Trucks
2 municipal fleets
1 school district



Suitable for DCFC or hydrogen fueling
Adjacent to existing gas station
Easy access from CA-20

1001 SUTTER ST, YUBA CITY, CA 95991

ADDRESS

1001 Sutter St, Yuba City, CA 95991

COORDINATES

39.1442° N, 121.6135° S

FREEWAY

Highways 99, 20, 70

CATEGORY

Vacant land, for sale

SITE DESCRIPTION

The site is a vacant parcel with convenient highway access SR-20 and SR-70, and within two miles of Hwy 99.

ZONING

Industrial

LOT SIZE

0.61 acres

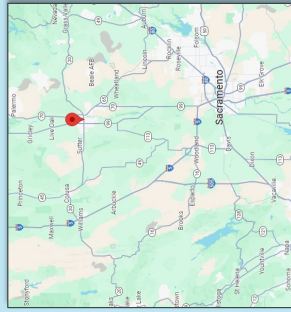
MEGAREGION WORKING GROUP MEMBER AGENCY

SACOG

ELECTRIC UTILITY

PG&E

REGIONAL MAP



POSSIBLE TECHNICAL SPECIFICATIONS



CHARGING INFRASTRUCTURE

- Up to four DCFC stations with 350 kW
- Four pull-through stalls for medium- and heavy-duty EV charging (possibly more if only medium-duty vehicles)
- Total power supply needed: up to 700 kW

Conceptual Equipment Layout



Electric Grid Considerations

- Installing two dual-head DCFC stations with a total power output of 350 kW each and providing appropriate site lighting would result in a total estimated site load of 702 kW.
- Site voltage of 480 V with a service size of 1,200 A is recommended

Available capacity:

- Local distribution circuit:** ~10.5 MW rating, peak demand (between now and 2027) is projected at ~7.3 MW, leaving ~3.2 MW of available circuit capacity
- Local substation bank:** ~6.6 MW of available capacity

Potential utility upgrades:

- Developers with site loads exceeding 4 MW are advised to perform a preliminary load study with PG&E to understand cost and schedule of necessary upgrades
- Line upgrade projects could be 24-36 months with budgets of \$2-5M*
- Substation upgrades could be 48-60 months with budgets of \$15-30M*
- *Depending on actual load, PG&E may share costs with the developer.

OR



H₂ REFUELING INFRASTRUCTURE

- Up to three H₂ refueling dispensers
- One dispensing island
- Location of hydrogen equipment (high-pressure compressor, storage module) to be confirmed as part of station design process

Conceptual Equipment Layout



Hydrogen Considerations

- Hydrogen to be delivered and stored on-site
- Manageable power needs to support hydrogen fueling

ACCESSIBILITY AND AMENITIES

ACCESSIBILITY

- Site is within 1 mi of highway access
- Frontage roads generally accessible to tractors with 40' trailers
- Site ingress/egress is space-constrained. Existing driveway at adjacent gas station may need to be used.

CURRENT AND POTENTIAL AMENITIES

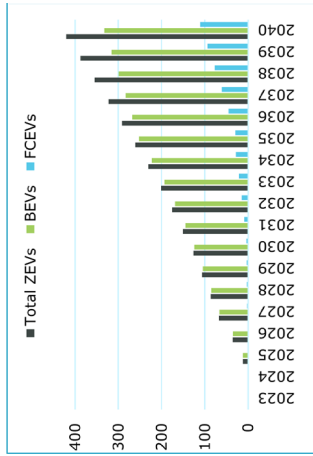
- Existing: convenience store with gas station on adjacent property (1 mi), street lighting
- Recommended: on-site restrooms, lighting, and Wi-Fi service

STATION NEEDS

PROJECTED ZEVS FOR GOODS MOVEMENT

The projected number of ZEV trucks for freight and goods movement (including agriculture) in Yuba County. This includes trucks that have terminals in Yuba County and estimated trucks that visit Yuba County businesses (including farms and ranches) daily.

Projected Number of Resident and Daily Transient ZEV Trucks:



Source: Frontier Energy

POTENTIAL USERS

USERS WITHIN 5 MILES	MHD VEHICLES
LONG-HAUL TRUCKING	1,000 trucks at 30+ companies
AGRICULTURAL TRUCKING	300 trucks at 13 businesses
NEW LEGEND, INC.	500 trucks
HELENA CHEMICAL	100 trucks
SUNSWEEET GROWERS	100+ trucks daily
PEPSI CO, INC.	75 trucks
SUTTER COUNTY PUBLIC WORKS FLEET	300 MHD vehicles
YUBA CITY PUBLIC WORKS FLEET	100 MHD vehicles
MARYSVILLE JOINT UNIFIED SCHOOL DISTRICT	100 MHD vehicles

Source: Valjei ProsserFleet

ESTIMATED DAILY VMT	WITHIN 1 MILE OF SITE	WITHIN 5 MILES OF SITE
TOTAL VMT	201,300	1,594,600
FREIGHT/TRUCK VMT	9,300	102,300
	4.6%	6.4%
FREIGHT/TRUCK VMT 65+ MILE TRIPS	900	26,800
	8.6%	26.2%

Source: Replica

1001 SUTTER ST, YUBA CITY, CA 95991

ADDRESS

1001 Sutter St, Yuba City, CA 95991

FREEWAY

Highways 99, 20, 70

ZONING

Industrial/Heavy Commercial

LOCAL ENGAGEMENT

- Yuba-Sutter Economic Development Corporation
- Yuba-Sutter Farm Bureau
- Yuba County Office of Education
- Yuba-Sutter Chamber of Commerce
- City of Yuba City Economic Development Department
- Yuba-Sutter United Way
- Yuba-Sutter Regional Arts Council
- Yuba City Unified School District

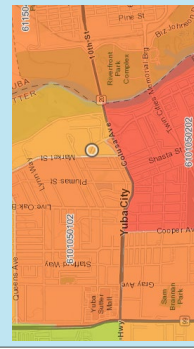
POTENTIAL FUNDING AGENCIES

- California Energy Commission
- California Transportation Commission
- Joint Office of Department of Energy and Department of Transportation
- USDA
- PG&E

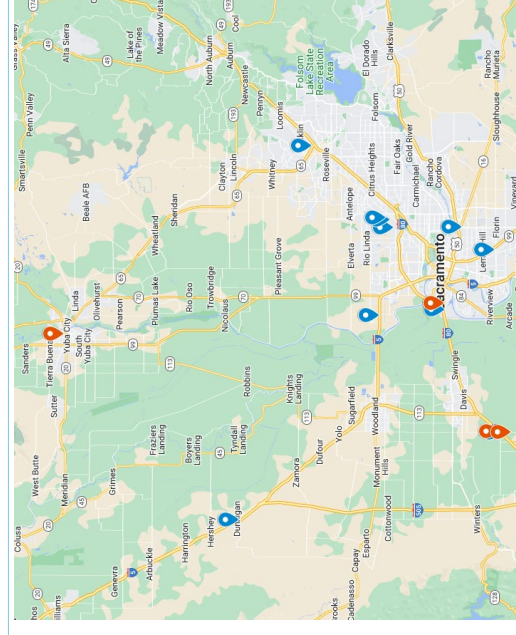
ELECTRIC UTILITY

PG&E

CALENVIROSCREEN MAP



LOCATION COMPARED TO PLANNED AND PROPOSED STATIONS



LOCAL PARTNERS

- PERMITS:** Yuba City for building permits and business license. Feather River AQMD for Authority to Construct.
- CRQA:** This is undeveloped land and will require CEQA, and NEPA if federally funded.
- ROADWAY:** This site will require an additional driveway with an access point to Sutter St and may require a traffic study. Contact Yuba City Development Services.
- HYDROGEN SETBACK:** This site is narrow and will require careful engineering for hydrogen storage. Contact CAL FIRE and GO-Biz.
- ELECTRICAL:** This site will require electrical upgrades for DCFC. Contact PG&E.

POTENTIAL BUSINESS MODELS

This location is a smaller lot adjacent to an existing gas station. It is best suited for pass-through traffic, not overnight parking.

PUBLIC STATION:

Private development by a commercial fleet user or station developer using State of California or federal grants, IRS tax credits, and incentive programs for a public station. Potential users include companies and owner/operators that are:

- Seasonal transportation for agriculture distribution
- Daily FOB service for Sunsweet and other distribution
- Locally based freight operators
- FOB trucks dispatched by New Legend
- Last-mile and local delivery

CHARGING AS A SERVICE:

Private development by a station developer in partnership with one or more fleet user using State of California or federal grants, IRS tax credits, and incentive programs. Potential users include dedicated fleets that include:

- Helena Chemical
- Sutter County fleet
- Yuba City fleet
- Marysville Joint Unified School District

LOCAL ENGAGEMENT

Recommended Outreach Tactics

Outreach Formats: Social media campaigns, hosting community meetings, and setting up informational booths at local events to effectively disseminate information and gather feedback. Simplifying engagement strategies with fliers, posts in local Facebook groups, and booths at local markets to facilitate casual yet informative discussions among community members.

Events for Discussion: Utilizing the Yuba City Farmers Market and the Annual Summerfest as platforms to engage the community, offering an informal setting to discuss the project and its impacts. Organizing community meetings at local schools or community centers, ensuring these events are well-advertised to maximize community participation.

Organizations to Engage: Collaborating with the Chamber of Commerce to understand and integrate the business community's perspectives on the project. Engaging neighborhood associations that have experience in organizing community responses to similar developments, leveraging their insights for effective community engagement.

Results of local outreach

Many Sutter County/Yuba City survey respondents appreciate the move towards cleaner transport yet worry about increased traffic and property value impacts. Some fear the project may alter the neighborhood's character, while others see potential benefits for local commerce and sustainability.

Key suggestions include thorough planning to manage traffic, protect property values, and ensure the development blends with the area's aesthetics. Engaging local stakeholders—schools, farmer's associations, and business councils—is seen as vital for addressing concerns and building support.

Overall, there's a call for the project to balance environmental gains with community interests and economic benefits, underscoring the need for a strategy that minimizes negative effects while maximizing positive impacts on the community and environment.

ECONOMIC IMPACTS

Filling with off-peak electricity or hydrogen will save money compared to filling with traditional fuels. It will be important to levelized the cost of electricity across utilities and times of day so that operators can have more certainty. The transition to ZEV fuels will greatly reduce state and local tax revenue. Local governments need to start planning to understand the impact.

Projected Fuel Cost to Drive 100 Miles



Gas and diesel price includes state and federal excise tax, state and local sales tax, cost of fuel, overhead and profit. Electricity price includes cost of fuel. Hydrogen price includes state and local sales tax, cost of fuel.



Galt ZEV Fueling Site

ADDRESS

695-710 Spaans Dr
Galt, CA 95632

ZONING

Commercial

PROPERTY

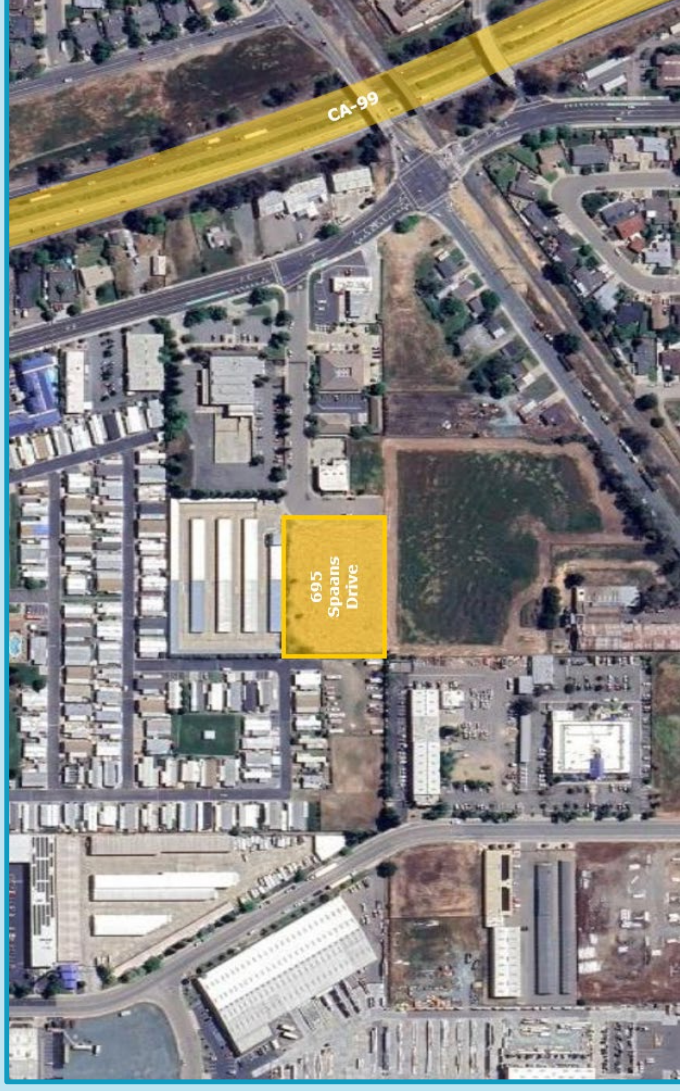
4 acres
Undeveloped land

ACCESS TO

Highway 99

POTENTIAL USERS

400+ trucks
1 municipal fleet
USPS



Suitable for DCFC or hydrogen fueling
Adjacent to self-storage facility
Easy access from CA-99

695 SPAANS DR, GALT, CA 95632

ADDRESS

695-710 Spaans Dr
Galt, CA 95632

COORDINATES

38.265254° N, 121.303903° S

FREEWAY

Highway 99

CATEGORY

Vacant land

SITE DESCRIPTION

The site is a vacant parcel within .5 miles of highway access

ZONING

Commercial

LOT SIZE

4 acres

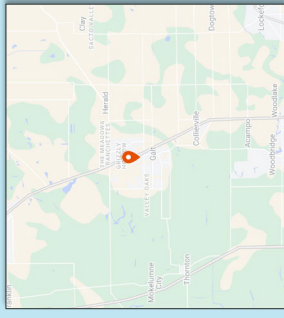
MEGAREGION WORKING GROUP MEMBER AGENCY

SACOG

ELECTRIC UTILITY

SMUD

REGIONAL MAP



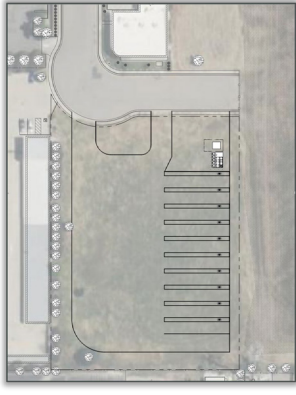
POSSIBLE TECHNICAL SPECIFICATIONS



CHARGING INFRASTRUCTURE

- Up to 10 DCFC stations with 350 kW
- 10 forward-in back-out stalls for medium- and heavy-duty EV charging (possibly more if only medium-duty vehicles)
- Total power supply needed: up to 1,750 kW

Conceptual Equipment Layout



Electric Grid Considerations

- Installing 10 DCFC dispensers with a total power output of 350 kW each and providing appropriate site lighting would result in a total estimated site load of 1,757 kW.
- Site voltage of 480 V with a service size of 3,000 A is recommended

Available capacity:

- Local distribution circuit: ~10.1 MW radial load demand (between 0.7 and 30.27) is projected at 6 MW leaving ~4.1 MW of available circuit capacity
- Local substation bank: ~1.3 MW of available capacity

Utility upgrades:

- Developers with proposed site loads exceeding 4 MW are advised to perform a preliminary load study with PG&E to understand cost and schedule of necessary upgrades
- Line upgrade projects could be 18-24 months with budgets of \$2-5M
- Substation upgrades could be 48-60 months with budgets of \$15-50M

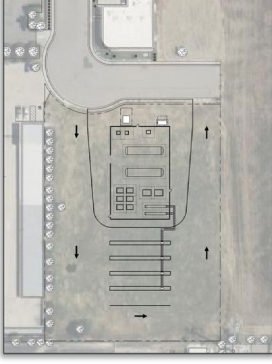
or



H₂ REFUELING INFRASTRUCTURE

- Up to 4 H₂ refueling dispensers
- Dispensers placed in between pull-through stalls
- Location of hydrogen equipment (liquid/gaseous H₂ storage tanks, pumps, etc.) to be confirmed as part of station design process

Conceptual Equipment Layout



Hydrogen Considerations

- Hydrogen to be delivered and stored on-site
- Manageable power needs to support hydrogen fueling

ACCESSIBILITY AND AMENITIES

ACCESSIBILITY

- Site is within 0.5 mi of highway access
- Frontage roads generally accessible to tractors with 40' trailers
- Site ingress/egress is space-constrained.

- Conceptual designs vetted for trucks with up to 4 axles and a single trailer.
- During peak commute hours, local roads and highway ramps are congested

CURRENT AND POTENTIAL AMENITIES

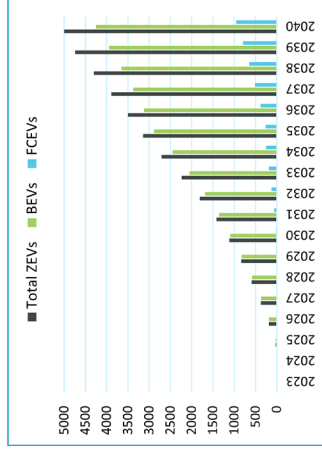
- Existing: one restaurant and one tobacco store within 1-min walking distance, some street lighting
- Recommended: on-site restrooms, lighting, and Wi-Fi service

STATION NEEDS

PROJECTED ZEVS FOR GOODS MOVEMENT

The projected number of ZEV trucks for freight and goods movement, including agriculture, in Galt. This includes trucks that have terminals in Galt and estimated trucks that visit Galt businesses, including farms and ranches, daily.

Projected Number of Resident and Daily Transient ZEV Trucks:



Source: Frontier Energy

POTENTIAL USERS

USERS WITHIN 5 MILES	MHD VEHICLES
LONG-HAUL TRUCKING	135 trucks at 3+ companies
AGRICULTURAL TRUCKING	149 trucks at 7 businesses
CALIFORNIA WASTE RECOVERY LLC	45 trucks
CITY OF GALT PUBLIC WORKS	45 trucks
BUILDING MATERIAL DISTRIBUTORS INC.	45 trucks
PUBLIC WORKS FORP YARD	100 MHD vehicles
USPS	50 MHD vehicles

Source: Valjeen ProsperFleet

ESTIMATED DAILY VMT	WITHIN 1 MILE OF SITE	WITHIN 5 MILES OF SITE
TOTAL VMT	232,700	814,600
FREIGHT/TRUCK VMT	29,600	94,100
	12.7%	11.6%
FREIGHT/TRUCK VMT 65+ MILE TRIPS	10,800	34,200
	36.5%	36.3%

Source: Replica



695-710 SPAANS DR, GALT, CA 95632

ADDRESS

695-710 Spaans Dr, Galt, CA 95632

COORDINATES

38.265254° N, 121.303903° S

FREEWAY

Highway 99

SITE DESCRIPTION

4-acre vacant parcel with convenient highway access to SR-99.

ZONING

Commercial

COMMUNITY BASED ORGANIZATIONS

Galt District Chamber of Commerce
City of Galt Economic Development Department
Galt Market
Galt Youth Commission

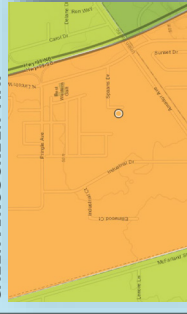
POTENTIAL FUNDING AGENCIES

California Energy Commission
California Transportation Commission
Joint Office of Department of Energy and Department of Transportation
USDA
PG&E

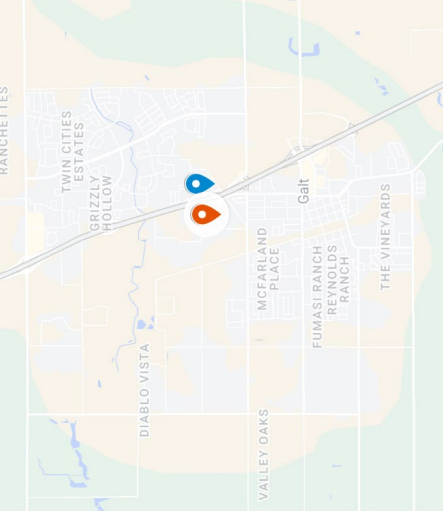
ELECTRIC UTILITY

SMUD

CALENVIROSCREEN MAP



LOCATION COMPARED TO PLANNED AND PROPOSED STATIONS



LOCAL PARTNERS

PERMITS: City of Galt Building Department for building permits and business license. Sacramento Metropolitan Air Quality Management District to obtain a Permit to Operate.

CEQA: This is undeveloped land and will require CEQA, and NEPA if federally funded.

ROADWAY: This site is vacant land with approved plans for four warehouse buildings. Contact City of Galt Community Development Department.

HYDROGEN SETBACK: This site will require engineering for hydrogen storage. Contact CAL FIRE and GO-Biz.

ELECTRICAL: This site will require electrical upgrades for DCFC. Contact SMUD.

TRAFFIC: This is a traffic congested area and may require future improvements in partnership with Caltrans to expand or add access to Highway 99.

Blue pin: Proposed hydrogen station (on hold)

Red pin: Megaregion site

POTENTIAL BUSINESS MODELS

This location is an empty lot in an industrial area between SR-99 and I-5. It is adjacent to a self-storage business and near a mobile home park. It is better suited for trucks and buses rather than light-duty fueling.

PUBLIC STATION:

Private development by a commercial fleet user or station developer using State of California federal grants, IRS tax credits and incentive programs for a public station. The entity that operates the ZEV fuel depot and is responsible for profit/loss, and ancillary services.

Potential users pay for the fuel that they use and include companies and owner/operators that provide service to the nearby distribution centers and the USPS, and long-haul truckers that stop for a mandatory rest period.

CHARGING AS A SERVICE:

Private development by a station developer in partnership with one or more fleet users using State of California or federal grants, IRS tax credits, and incentive programs. The operator may charge subscribed customers a flat monthly fee, lease-to-own fee, or some other structure.

Potential users are the nearby distribution centers that require overnight parking/charging. This site may provide contracted charging or hydrogen to the City of Galt Public Works and USPS.

ANCILLARY SERVICES:

This is a large, deep lot that could provide overnight parking for trucks and trailers, potentially in partnership with the self-storage business. Caltrans Truck Parking Study and satellite images indicate that Amador Avenue is an unauthorized truck parking area. The site has space for a truck wash or small lounge area for drivers.

LOCAL ENGAGEMENT

OUTREACH FORMATS:

- Utilizing social media, the City of Galt Newsletter, newspaper articles/advertisements, and public forums for widespread communication.
- Emphasizing the need for genuine community meetings where tough questions are addressed regarding traffic management, impact on local services, and the benefits for the community.
- Conducting real discussions rather than just formal presentations to ensure genuine engagement.

EVENTS FOR DISCUSSION:

- Hosting discussions during standalone public forums, as well as during City Council, City Commissions, and City Committee meetings.
- Organizing town hall meetings that are accessible to working individuals, emphasizing that these should be ongoing to facilitate continuous dialogue.
- Bringing up the project at community meetings frequently to maintain open communication.

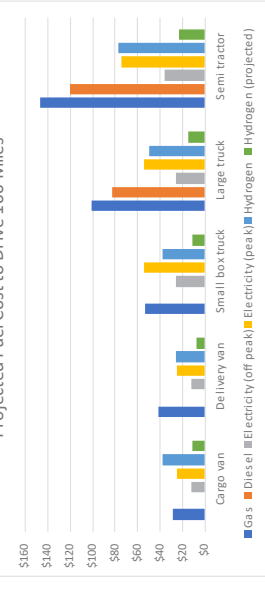
ORGANIZATIONS TO ENGAGE:

- While specific local organizations were not highlighted, there was a suggestion to involve independent traffic consultants, not just those hired by developers.
- Engaging directly with local residents to gather input, beyond just planners and developers, ensuring the community's actual needs and concerns are addressed.

ECONOMIC IMPACTS

Filling with off-peak electricity or hydrogen will save money compared to filling with traditional fuels. It will be important to levelized the cost of electricity across utilities and times of day so that operators can have more certainty. The transition to ZEV fuels will greatly reduce state and local tax revenue. Local governments need to start planning to understand the impact.

Projected Fuel Cost to Drive 100 Miles



Gas and diesel price includes state and federal excise tax, state and local sales tax, cost of fuel, overhead and profit. Electricity price is kWh charge only. Hydrogen price includes state and local sales tax, cost of fuel.

Flag City ZEV Fueling Site

ADDRESS
15314 Thornton Rd
Lodi, CA 95242

ZONING
Commercial

PROPERTY
4.96 acres
Undeveloped land
Listed for sale

ACCESS TO
Highway 12 and I-5

POTENTIAL USERS
630 local trucks
13+ agricultural fleets
Hundreds of trucks daily



Suitable for DCFC or hydrogen fueling
Adjacent to existing truck stops
Direct access from I-5 and Highway 12

15314 N. THORNTON ROAD AT CA-12, LODI, CA 95242

ADDRESS
13314 Thornton Rd
Lodi, CA 95242

COORDINATES
38.119879° N, 121.393852° S

FREEWAY
Highway 12 and I-5

CATEGORY
Vacant land, for sale

SITE DESCRIPTION
The site is in "Flag City" and direct access to I-5 and Highway 12.

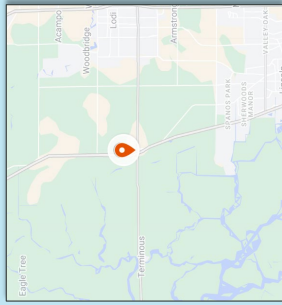
ZONING
Commercial

LOT SIZE
4.96 acres

MEGAREGION WORKING GROUP MEMBER AGENCY
SICOG

ELECTRIC UTILITY PG&E

REGIONAL MAP

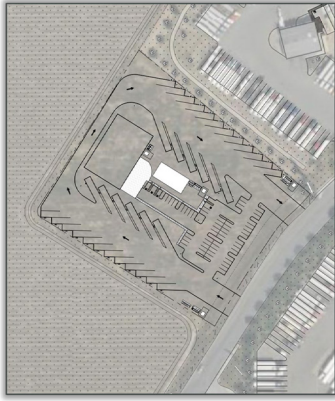


POSSIBLE TECHNICAL SPECIFICATIONS

CHARGING INFRASTRUCTURE

- Up to 18 dual-head DCFC stations with 350 kW
- 36 angled stalls for medium- and heavy-duty EV charging (possibly more if only medium-duty vehicles)
- Total power supply needed: up to 6,300 kW

Conceptual Equipment Layout



Electric Grid Considerations

- Installing 18 dual-head DCFC stations with a total power output of 350 kW each, a ~15,000-sqft. convenience store with an estimated building load of 150 kW and providing appropriate site lighting would result in a total estimated site load of about 6,470 kW.
- Site voltage of 12,000 V with a service size of 1,200 A is recommended

- Available capacity:**
 - Local distribution circuit: ~18.96 MW rating, peak demand (between now and 2027) is projected at ~17.95 MW, leaving ~1.0 MW of available circuit capacity
 - Local substation bank: ~20.2 MW of available capacity
- Utility upgrades:**
 - Developers with site loads exceeding 4 MW are advised to perform a preliminary load study with PG&E to understand cost and schedule of necessary upgrades
 - Line upgrade projects could be 18-24 months with budgets of \$2-5M
 - Substation upgrades could be 48-60 months with budgets of \$15-30M

or

H₂ REFUELING INFRASTRUCTURE

- Up to 4 H₂ refueling dispensers
- Dispensers placed in between pull-through stalls
- Location of hydrogen equipment (liquid/gaseous H₂ storage tanks, pumps, etc.) to be confirmed as part of station design process

Conceptual Equipment Layout



Hydrogen Considerations

- Hydrogen to be delivered and stored on-site
- Manageable power needs to support hydrogen fueling

ACCESSIBILITY AND AMENITIES

ACCESSIBILITY

- Site is within 0.25 mi of highway access (adjacent to truck stop/travel center)
- Frontage roads accessible to tractors with 40' trailers
- Site ingress/egress can be designed to meet the needs of heavy-duty trucks. Conceptual designs vetted for trucks with up to 4 axles and a single trailer.

CURRENT AND POTENTIAL AMENITIES

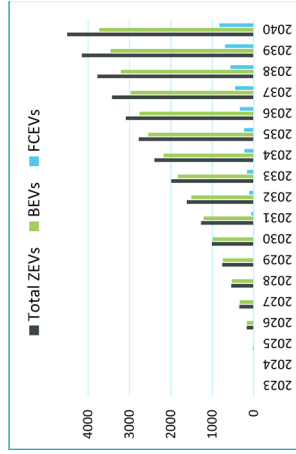
- Existing: truck stop and travel center with convenience store within 2-min walking distance, some street lighting
- Recommended: on-site convenience store (as shown in conceptual EV charging design) with restrooms, lighting, and Wi-Fi service

STATION NEEDS

PROJECTED ZEVS FOR GOODS MOVEMENT

The projected number of ZEV trucks for freight and goods movement, including agriculture, in Lodi. This includes trucks that have terminals in Lodi and estimated trucks that visit Lodi businesses, including farms and ranches, daily.

Projected Number of Resident and Daily Transient ZEV Trucks:



Source: Frontier Energy

POTENTIAL USERS

USERS WITHIN 5 MILES	MHD VEHICLES
LONG-HAUL TRUCKING	97 trucks at 4+ companies
AGRICULTURAL TRUCKING	352 trucks at 11 businesses
CENTRAL VALLEY BULK TRANSPORTATION	45 trucks
FRANK C ALEGRE TRUCKING	45 trucks
ODYSSEY LANDSCAPE	45 trucks
RHINO FREIGHT LINE, INC.	50 MHD vehicles
FAROOQ TRUCKING	50 MHD vehicles
Source: Valgren Prosser/Feet	

ESTIMATED DAILY VMT OF SITE	WITHIN 1 MILE OF SITE	WITHIN 5 MILES OF SITE
TOTAL VMT	307,700	1,211,700
FREIGHT/TRUCK VMT	62,500	212,700
	20.3%	17.6%
FREIGHT/TRUCK VMT 65+ MILE TRIPS	28,300	92,100
	45.3%	43.3%
Source: Replica		

California's Advanced Clean Fleets (ACF) regulation applies to "priority fleets"—entities that operate or contract to operate 50 or more trucks in California or operator or contract to operate at least one truck and have gross revenues of \$50 million or more. Starting on January 1, 2024, 100% of trucks added to a priority fleet must be a zero-emission truck.

ACF also applies to government fleets and requires that 50% of medium- and heavy-duty vehicles added to the fleet during 2024-2026 are ZEVs and 100% are ZEV in 2027.

California's Advanced Clean Trucks regulation requires that truck manufacturers and dealers sell an increasing number of ZEVs each year.

The result of these two regulations, along with US EPA Heavy-Duty GHG Emission Standards, result in a rapid increase in the number of battery and fuel cell electric trucks starting in 2026. By 2035, all new trucks will require charging stations or hydrogen stations.

"Flag City" has several local trucking fleets, and it is an essential location for existing off-highway services, including hotels, travel plazas, fast food, and RV parks. It will be an important location for overnight charging, DCFC, and hydrogen. In the future, it can support the transition of RVs to ZEVs.

15314 THORNTON RD, LODI, CA 95242

ADDRESS

15314 Thornton Rd
Lodi, CA 95242

COORDINATES

38.119879° N, 121.393852° S

FREEWAY

Highways 12 and 5

SITE DESCRIPTION

Vacant 5-acre lot in "Flag City" and direct access to I-5 and Highway 12.

ZONING

Commercial

POTENTIAL FUNDING AGENCIES

California Energy Commission
California Transportation Commission
Joint Office of Department of Energy and Department of Transportation
USDA
PG&E

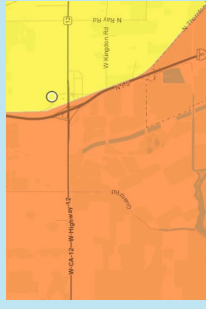
ELECTRIC UTILITY

PG&E

LOCAL ENGAGEMENT

Lodi Chamber of Commerce
Lodi District Grape Growers Assn.
Lodi Wine Commission
Lodi Economic Development Dept.

CALENVIROSCREEN MAP



LOCATION COMPARED TO PLANNED AND PROPOSED STATIONS

LOCAL PARTNERS

PERMITS: San Joaquin County for building permits and business license. San Joaquin Valley APCD for Authority to Construct.

CEQA: This is undeveloped land and will require CEQA, and NEPA if federally funded.

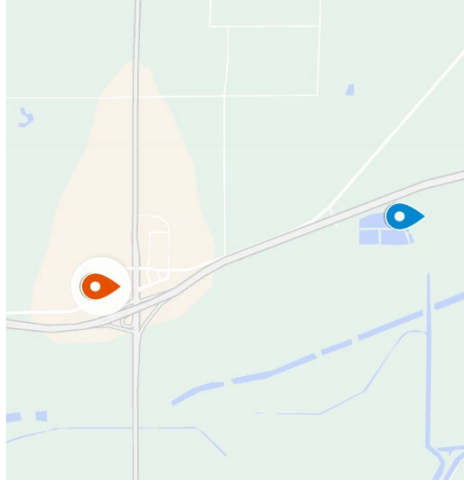
ROADWAY: This site is proposed to be a trailer parking year and/or repair shop and has preliminary drawings that include pre-approved areas for driveways and landscaping.

HYDROGEN SETBACK: This is a large site with no adjacent structures. It will easily comply with NFA and CAL FIRE codes for hydrogen storage and onsite production.

ELECTRICAL: This site will require electrical upgrades for DCF.

Blue pin: Planned and proposed ZEV fuel stations

Red pin: Megaregion identified locations



POTENTIAL BUSINESS MODELS

This location is an empty lot adjacent to I-5 and SR 12. It is an existing off-highway travel center that caters to truck, cars, and RVs.

PUBLIC STATION:

Private development by a commercial fleet user or station developer under State of California or federal grants, IRS tax credits, and incentive programs for a public station. Potential users include companies and owner/operators that are long-haul or drop-and-swap FOB or LTL carriers. Some will charge overnight, most will use DCF or hydrogen.

TRUCKS AS A SERVICE:

The site can be configured for 86 trailer parking stalls and a small lounge area. Access to two major trucking routes make it a good location for station operators that provide fully charged/fueled semis that drivers lease by the mile or by the trip.

DEMAND MANAGEMENT:

This is a large site with no obstructions and could support a solar array and battery storage. The operator could sell fuel to drivers, participate in PG&E's demand management program, and potentially participate in the CASO day-ahead market.

It may have the potential for onsite hydrogen production from agricultural waste.

LIGHT DUTY:

This is a busy off-highway exit that includes hotels, fast food, two travel plazas, and two RV parks. The nearest charging stations are in Lodi and in Stockton, and hydrogen fuel is in Sacramento and Coalinga. Providing a fuel island or sharing charging stations with LDVs could create additional baseload.

LOCAL ENGAGEMENT

OUTREACH FORMATS:

- Conducting information sessions and town hall meetings regularly to provide detailed information about the project's traffic impacts, environmental concerns, and overall plans.
- Gathering input directly from daily road users, including surveys at major intersections and via online platforms, to understand and consider their daily experiences and needs.
- Using innovative methods like QR codes on signs along major highways to collect broad and diverse input on commuting patterns and business impacts

EVENTS FOR DISCUSSION:

- Setting up interactive booths or presentations at Hutchins Street Square during community events to facilitate widespread community engagement.
- Joining agricultural co-op meetings and local business forums, including the Lodi Chamber of Commerce, to discuss the project's impact on local business operations and opportunities

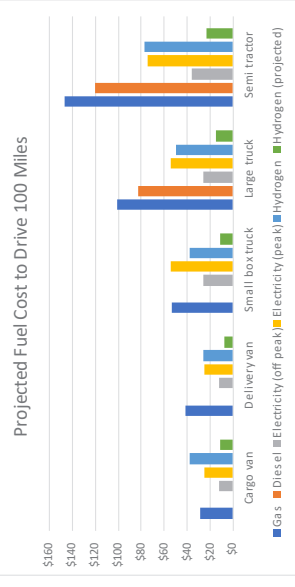
ORGANIZATIONS TO ENGAGE:

- Chambers of commerce and agricultural associations to ensure the station meets the needs of seasonal goods movement.
- Collaborating with urban planners, local business alliances, and academic economists to develop a well-rounded strategy that is grounded and forward-thinking.

ECONOMIC IMPACTS

Filling with off-peak electricity or hydrogen will save money compared to filling with traditional fuels. It will be important to levelized the cost of electricity across utilities and times of day so that operators can have more certainty.

The transition to ZEV fuels will greatly reduce state and local tax revenue. Local governments need to start planning to understand the impact.



Gas and diesel price includes state and federal excise tax, state and local sales tax, cost of fuel, overhead and profit. Electricity price is kWh charge only. Hydrogen price includes state and local sales tax, cost of fuel.

Stockton ZEV Fueling Site

ADDRESS
1422-1513 Boeing Way
Stockton, CA 95206

ZONING
Industrial

PROPERTY
14 acres (2 parcels)
Undeveloped land
Listed for sale

ACCESS TO
Highways 99 and 4, I-5

POTENTIAL USERS
2,509+ trucks
10+ distribution centers



Suitable for DCFC or hydrogen fueling
Adjacent to Stockton Metropolitan Airport
Easy access to Highway 99 and I-5

1422-1513 BOEING WAY, STOCKTON, CA 95206

POSSIBLE TECHNICAL SPECIFICATIONS

ADDRESS

1422-1513 Boeing Way
Stockton, CA 95206

COORDINATES

37.906507° N, 121.255485° S

FREEWAY

Highways 99 and 4, I-5

CATEGORY

Vacant land, for sale

SITE DESCRIPTION

The site is a vacant parcel within 2 miles of highway access

ZONING

Industrial

LOT SIZE

1422: 8.75 acres
1513: 5.48 acres

MEGAREGION WORKING GROUP

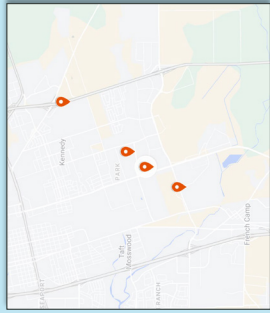
MEMBER AGENCY

SJCOG

ELECTRIC UTILITY

PG&E

REGIONAL MAP



CHARGING INFRASTRUCTURE

- Up to 76 DCFC stations with 350 kW
- 76 pull-through stalls for medium- and heavy-duty EV charging (possibly more if only medium-duty vehicles)
- Total power supply needed: up to 13,300 kW

Conceptual Equipment Layout



Electric Grid Considerations

- Installing 38 dual-head DCFC stations with a total power output of 350 kW each, a ~15,000-sq-ft convenience store with an estimated building load of 130 kW and providing appropriate site lighting result in a total estimated site load of 13.5 MW.
- Site voltage of 12,000 V with a service size of 1,200 A is recommended

• Available capacity:

- Local distribution circuit: PG&E circuit load projections are not available for this site, ~0.4 MW of estimated available circuit capacity

- Local substation bank: PG&E substation bank loading projections are not available for this site, ~0 MW of estimated available capacity

• Utility upgrades:

- Necessary utility upgrades at this site expected to require at least 5 years
- Developers with site loads exceeding 4 MW are advised to perform a preliminary load study with PG&E to understand cost and schedule of necessary upgrades
- Line upgrade projects could be 18-24 months with budgets of \$2-5M
- Substation upgrades could be 48-60 months with budgets of \$15-30M



H₂ REFUELING INFRASTRUCTURE

- Up to 4 H₂ refueling dispensers
- Dispensers placed in between pull-through stalls
- Location of hydrogen equipment (liquid/gaseous H₂ storage tanks, pumps, etc.) to be confirmed as part of station design process

Conceptual Equipment Layout



Hydrogen Considerations

- Hydrogen to be delivered and stored on-site
- Smaller power needs to support hydrogen fueling than electric truck charging

ACCESSIBILITY AND AMENITIES

ACCESSIBILITY

- Site is within 1 mi of access to I-5, within 2.5 mi of SR-99, and within 4 mi of SR-4.
- Frontage roads generally accessible to tractors with 40' trailers

- Site ingress/egress can be designed to meet the needs of heavy-duty trucks. Conceptual designs vetted for trucks with up to 4 axles and a single trailer

CURRENT AND POTENTIAL AMENITIES

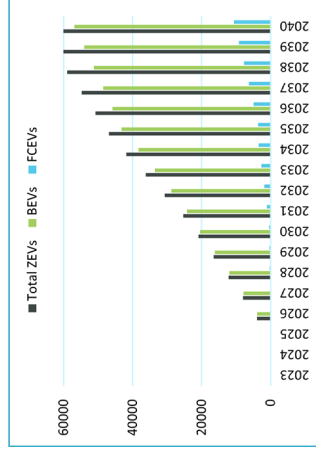
- Existing: one restaurant within 10-min walking distance, street lighting
- Recommended: on-site convenience store (as shown in conceptual EV charging design) with restrooms, lighting, and Wi-Fi service

STATION NEEDS

PROJECTED ZEVS FOR GOODS MOVEMENT

The projected number of ZEV trucks for freight and goods movement in the Airport Industrial Park. This includes trucks that have terminals and visit businesses within five miles of the industrial park.

Projected Number of Resident and Daily Transient ZEV Trucks:



Source: Frontier Energy

POTENTIAL USERS

USERS WITHIN 5 MILES	MHD VEHICLES
LONG-HAUL TRUCKING	859 trucks at 23+ companies
SRI SURGICAL EXPRESS STOCKTON	200 trucks
WILLIAMS TANK LINES	200 trucks
JM EAGLE	50 MHD vehicles
COASTAL PACIFIC FOOD DISTRIBUTION	100 MHD vehicles
C&S WHOLESALE GROCERS INC	100 MHD vehicles
AMAZON	200 MHD vehicles

ESTIMATED DAILY VMT OF SITE	WITHIN 1 MILE OF SITE	WITHIN 5 MILES OF SITE
TOTAL VMT	201,300	1,594,600
FREIGHT/TRUCK VMT	9,300	102,300
	4.6%	6.4%
FREIGHT/TRUCK VMT 65+ MILE TRIPS	900	26,800
	8.6%	26.2%

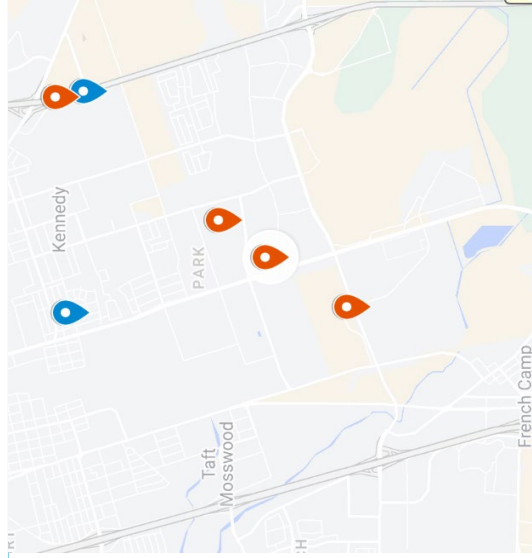
Source: Replica



1422-1513 BOEING WAY, STOCKTON, CA 95206

ADDRESS 1422-1513 Boeing Way, Stockton, CA 95206	
FREEWAY Highways 99 and 4, I-5	
DESCRIPTION Two adjacent vacant lots that are about 14 acres combined	
ZONING Industrial	
POTENTIAL FUNDING AGENCIES California Energy Commission California Transportation Commission Joint Office of Department of Energy and Department of Transportation PG&E	
ELECTRIC UTILITY PG&E	
LOCAL ENGAGEMENT San Joaquin County Hispanic Chamber of Commerce Stockton Chamber of Commerce Stockton Economic Empowerment Demonstration (SEED) Stockton Strong City of Stockton Economic Development Department United Way of San Joaquin County	CALENVIROSCREEN MAP 

LOCATION COMPARED TO PLANNED AND PROPOSED STATIONS



LOCAL PARTNERS

PERMITS: City of Stockton for building permits and business license. San Joaquin Valley APCD for Authority to Construct.

CEQA: This is undeveloped land and will require CEQA, and NEPA if federally funded.

ROADWAY: This site will require driveway on S Airport Way and/or Boeing Way and may require a traffic study. Contact Stockton Community Development Department.

ELECTRICAL: This site will require electrical upgrades for DCF. Contact PG&E.

AIRPORT: This site is directly in line with the runway at Stockton Municipal Airport. It will require coordination with the Airport and with Caltrans. If hydrogen or a battery storage system is proposed for this site, it will require additional coordination with FAA and CAL FIRE.

FAA: Federal Aviation Administration Regulation Part 77 restricts the height of structures near airports. Coordinate with Caltrans, FAA, and the City of Stockton to identify the potential restrictions for buildings, canopies, and solar.

Blue pins: Planned and proposed ZEV fuel stations

Red pins: Megaregion identified locations

POTENTIAL BUSINESS MODELS

This location is two empty lot in a growing industrial park near the Stockton Metropolitan Airport. It is already paved and striped for 109 trailer positions and has an area designated for a shower/restroom facility.

PUBLIC STATION:

Private development by a commercial fleet user or station developer using State of California or federal grants, IRS tax credits, and incentive programs for a public station. The entity owns and operates the ZEV fuel depot and is responsible for profit/loss, upkeep, and ancillary services. Potential users include companies and owner/operators that make daily trips between the Ports of Stockton and Oakland, the BNSF Railroad, and between food processors and retail stores.

It could also serve as overnight truck parking/charging for local businesses or long-haul drivers.

AMENITIES:

The busy intersection of S Airport Way and Boeing Drive could be a potential location for a food truck park, which may also provide a future potential for V2G integration.

DEMAND MANAGEMENT:

This is a large site with no obstructions and, upon FAA approval, may support a solar array and battery storage. The operator could sell fuel to drivers, participate in PG&E's demand management program, and potentially participate in the CASIO day-ahead market.

LIGHT DUTY:

This is a busy industrial park with many personal owned vehicles and light-duty fleet vehicles. Currently, one public charger is available at a nearby business and others are in the airport parking lot. Providing a fuel island or sharing charging stations with LDVs could create additional baseload.

LOCAL ENGAGEMENT

OUTREACH FORMATS:

- Hosting multiple community forums in accessible locations and ensuring presentations are available in multiple languages, especially Spanish.
- Conducting community meetings, ensuring that communication is two-way and accessible, with emphasis on including non-English speakers.
- Using innovative outreach methods to involve diverse community segments, with a focus on transparency regarding economic benefits and concerns.

EVENTS FOR DISCUSSION:

- Setting up informational tables at city hall meetings and events at the Stockton Waterfront.
- Organizing discussions in community centers or parks to facilitate easy access for residents to participate.
- Hosting discussions at business incubators, universities, and public spaces to engage a broad cross-section of the community, including using digital platforms to expand reach and facilitate wider participation.

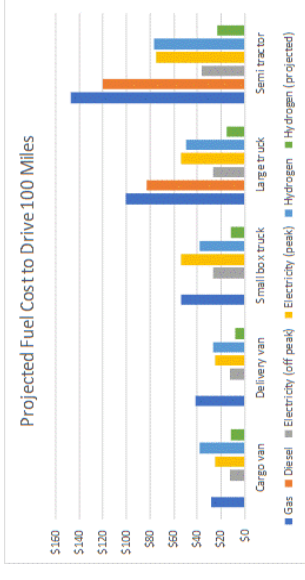
ORGANIZATIONS TO ENGAGE:

- Engaging community groups, local leaders, and ZEV experts.
- Consulting with traffic specialists and educational experts to ensure the project does not disrupt daily life.
- Collaborating with urban planners, local business alliances, and academic economists to develop a well-rounded strategy that is grounded and forward-thinking.

ECONOMIC IMPACTS

Filling with off-peak electricity or hydrogen will save money compared to filling with traditional fuels. It will be important to levelized the cost of electricity across utilities and times of day so that operators can have more certainty.

The transition to ZEV fuels will greatly reduce state and local tax revenue. Local governments need to start planning to understand the impact.



Gas and diesel price includes state and federal excise tax, state and local sales tax, cost of fuel, overhead and profit. Electricity price is kWh charge only. Hydrogen price includes state and local sales tax, cost of fuel.

Dixon ZEV Fueling Site

ADDRESS

8638 Sparling Ln
Dixon, CA 95620

ZONING

Industrial

PROPERTY

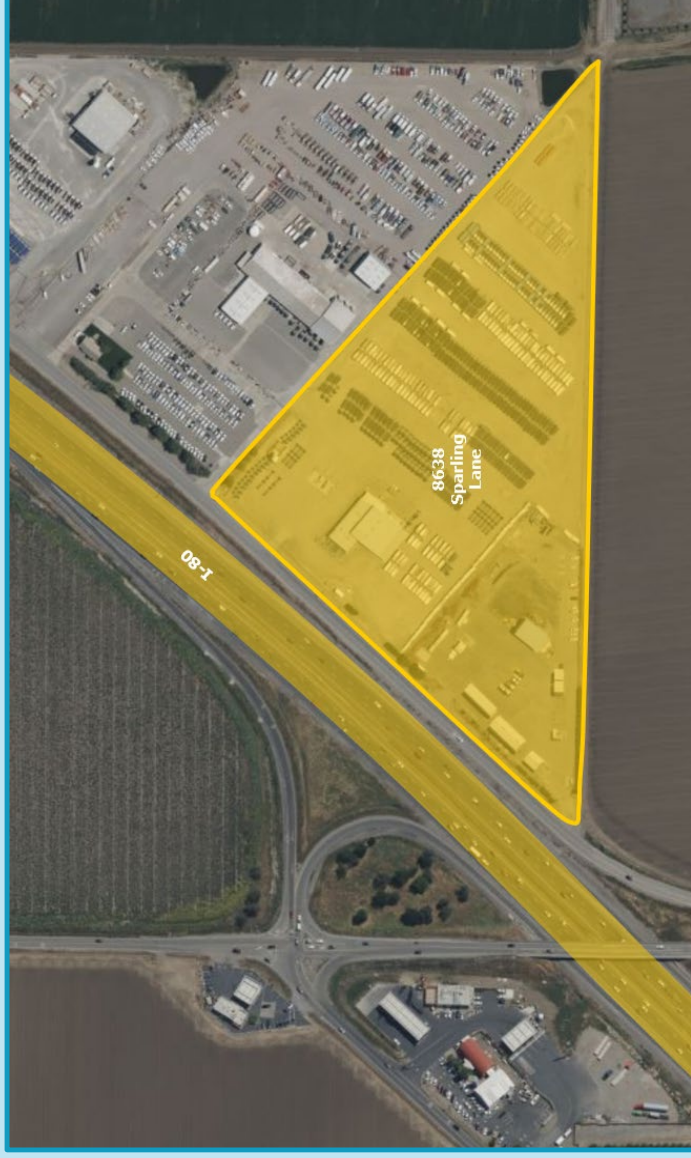
1.8 acres
Caltrans Maintenance Station

ACCESS TO

Interstates 80 and 505

POTENTIAL USERS

Caltrans fleet
Other State agencies
Solano
SolTrans



Suitable for DCFC or hydrogen fueling
Adjacent to existing fuel depot for Caltrans fleet
Easy access from I-80

CALTRANS MAINTENANCE STATION, 8638 SPARLING LN, DIXON, CA 95620

POSSIBLE TECHNICAL SPECIFICATIONS

ADDRESS

8638 Sparling Ln
Dixon, CA 95620

COORDINATES

38.489182° N, 121.802273° S

FREEWAY

Interstates 80 and 505

CATEGORY

Caltrans Maintenance Station

SITE DESCRIPTION

The site is a Caltrans Maintenance Station with convenient access to I-80 and I-505.

ZONING

Industrial

LOT SIZE

1.8 acres

MEGAREGION WORKING GROUP

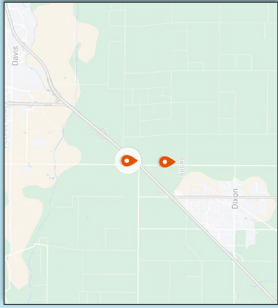
MEMBER AGENCY

SACOG

ELECTRIC UTILITY

PG&E

REGIONAL MAP



CHARGING INFRASTRUCTURE

- Up to 2 DCFC stalls with 350 kW
- 2 forward-in back-out stalls for medium- and heavy-duty EV charging (possibly more if only medium-duty vehicles)
- Total power supply needed: up to 700 kW

Conceptual Equipment Layout



Electric Grid Considerations

- Installing 1 DCFC station with a total power output of 350 kW and providing appropriate site lighting would result in a total estimated site load of 365 kW.
- Site voltage of 480 V with a service size of about 1,000 A is recommended

Available capacity:

- Local distribution circuit: ~12.4 MW rating, peak demand (between now and 2027) is projected at ~12.5 MW, leaving 0 MW of available circuit capacity

- Local substation bank: PG&E substation bank loading projections are not available for this site, ~0 MW or estimated available capacity

Utility upgrades:

- Necessary utility upgrades at this site expected to require at least 3-5 years
- Developers with site loads exceeding 4 MW are advised to perform a preliminary load study with PG&E to understand cost and schedule of necessary upgrades
- Line upgrade projects could be 18-24 months with budgets of \$2-5M
- Substation upgrades could be 48-60 months with budgets of \$15-30M

H₂ REFUELING INFRASTRUCTURE

- Up to 2 H₂ refueling dispensers
- Dispensers placed in between stalls
- Location of hydrogen equipment (liquid/gaseous H₂ storage tanks, pumps, etc.) to be confirmed as part of station design process

Conceptual Equipment Layout



Hydrogen Considerations

- Hydrogen to be delivered and stored on-site
- Smaller power needs to support hydrogen fueling than electric truck charging

ACCESSIBILITY AND AMENITIES

ACCESSIBILITY

- Site is along I-80
- Frontage roads are accessible to tractors with 40' trailers
- Current site design accounts for ingress/egress of heavy-duty trucks.

CURRENT AND POTENTIAL AMENITIES

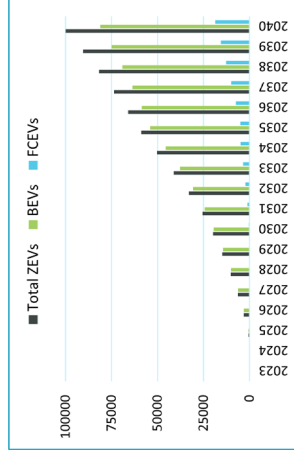
- Existing:
 - The site is a current Caltrans Maintenance Station
 - No street lighting
 - Restricted access
- Recommended: Allow selected other fleets access to the ZEV fuel station, including the City of Vacaville and Dixon, transit agencies, and other State agencies

STATION NEEDS

PROJECTED ZEVS FOR GOODS MOVEMENT

The projected number of ZEV trucks for freight and goods movement, including agriculture, in Dixon. This includes trucks that have terminals in Dixon and estimated trucks that visit Dixon businesses, including farms and ranches, daily.

Projected Number of Resident and Daily Transient ZEV Trucks:



Source: Frontier Energy

POTENTIAL USERS

USERS WITHIN 5 MILES	MHD VEHICLES
LONG-HAUL TRUCKING	17,501 trucks at 49+ companies
AGRICULTURAL TRUCKING	1,594 trucks at 37 businesses
STATE FARM	1000 trucks
SACRAMENTO CITY	1000 trucks
STATE OF CALIFORNIA	1250 trucks
GENCO DISTRIBUTION SYSTEM, INC.	1250 trucks
MIKE LOWRIE TRUCKING	25 MHD vehicles
CHEVEZ TRUCKING	50 MHD vehicles
Source: Valgen Propper fleet	

ESTIMATED DAILY VMT	WITHIN 1 MILE OF SITE	WITHIN 5 MILES OF SITE
TOTAL VMT	201,300	1,594,600
FREIGHT/TRUCK VMT	9,300	102,300
	4.6%	6.4%
FREIGHT/TRUCK VMT 65+ MILE TRIPS	900	26,800
	8.6%	26.2%
Source: Replica		

CALTRANS MAINTENANCE STATION, 8638 SPARLING LN, DIXON, CA 95620

ADDRESS
8638 Sparling Ln
Dixon, CA 95620

38.489182° N, 121.802273° S

FREEWAY
Interstates 80 and 505

SITE DESCRIPTION
Caltrans Maintenance Station with convenient access to I-80 and I-505

ZONING
Industrial

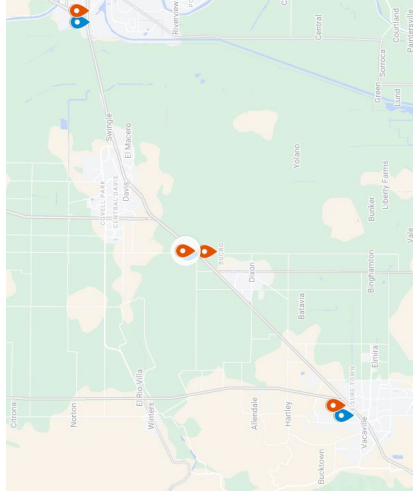
POTENTIAL FUNDING AGENCIES
California Energy Commission
Caltrans
PG&E

ELECTRIC UTILITY
PG&E

LOCAL ENGAGEMENT
Caltrans District 3
Solano County Community Action Partnership
Dixon Chamber of Commerce
City of Dixon Economic Development Department
Sustainable Solano

CALENVIROSCREEN MAP


LOCATION COMPARED TO PLANNED AND PROPOSED STATIONS



LOCAL PARTNERS

- PERMITS:** City of Dixon for building permits and business license. Yolo-Solano AQMD for Authority to Construct.
- CEQA:** This is developed land and may not require CEQA or NEPA if ground disturbance is minimal.
- ROADWAY:** This site is an existing fuel depot in a gated parking lot. If Caltrans decides to extend access to other vehicles, the site will need a wider driveway or a secondary access.
- HYDROGEN SETBACK:** This is a large site with no adjacent structures. It will easily comply with NFPA and CAL FIRE codes for hydrogen storage and onsite production.
- ELECTRICAL:** This site will require electrical upgrades for DCFC. Contact PG&E.

POTENTIAL BUSINESS MODELS

Caltrans controls this location, and it is not open to other entities.

Co-located Station

Caltrans builds or partners with a private developer to build a ZEV station on its land for its fleet, which can include offroad equipment. The station is available 24/7 to the Caltrans fleet.

As Caltrans gains operational experience and develops policies for shared fueling, Caltrans could either make the site available to pre-selected users or move the fence to allow public access while maintaining available for fleet vehicles with separate EVSE/hydrogen dispensers in the fleet-only area.

If paired with energy storage or a microgrid, this site could also provide resiliency to Caltrans and other State agencies during a wide-spread or long-term power outage.

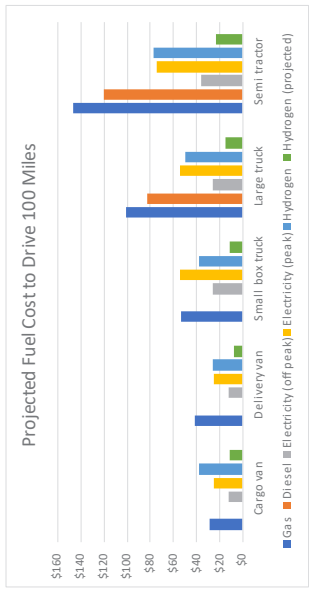
LOCAL ENGAGEMENT

- OUTREACH FORMATS:**
- Posting on the Dixon 411 Facebook Group or NextDoor App to reach a broad segment of the community.
 - Reaching out to the Solano County Farm Bureau for engagement with the agricultural community.
 - Hosting community workshops at the Dixon Public Library to engage older residents and those who may not attend city council meetings.
- EVENTS FOR DISCUSSION:**
- City Council, Planning Commission, or Special District Board Meetings as formal venues to discuss the project.
 - Monthly meetings of the Solano County Farm Bureau, specifically the first Monday of every month.
 - The annual Lambtown Festival, which could provide a unique opportunity for project discussion due to its local significance and high community involvement.
- ORGANIZATIONS TO ENGAGE:**
- Dixon Resource Conservation District (RCD) Board of Directors.
 - Dixon City Council and Board of Supervisors for policy and local government involvement.
 - The Solano Land Trust, which could provide insights on managing environmental impacts due to its focus on preserving agricultural land and open spaces.

ECONOMIC IMPACTS

Filling with off-peak electricity or hydrogen will save money compared to filling with traditional fuels. It will be important to levelized the cost of electricity across utilities and times of day so that operators can have more certainty.

The transition to ZEV fuels will greatly reduce state and local tax revenue. Local governments need to start planning to understand the impact.



Gas and diesel price includes state and federal excise tax, state and local sales tax, cost of fuel, overhead and profit. Electricity price is kWh charge only. Hydrogen price includes state and local sales tax, cost of fuel.

South Lake Tahoe ZEV Fueling Site

ADDRESS
2243 Cornelian Dr
South Lake Tahoe, CA 96150

ZONING
Commercial

PROPERTY
10 acres
Caltrans Maintenance Station

ACCESS TO
Highways 89 and 50

POTENTIAL USERS
Caltrans
Cal Fire
CHP
Department of Fish & Game
Department of Food & Ag
U.S. Forest Service
USPS



Suitable for DCFC or hydrogen fueling
Central location for several State agencies
Transition to ZEV fuels for private operators

CALTRANS MAINTENANCE STATION, 2243 CORNELIAN DR, SOUTH LAKE TAHOE, CA 96150

POSSIBLE TECHNICAL SPECIFICATIONS

ADDRESS

2243 Cornelian Dr
South Lake Tahoe, CA 96150

COORDINATES

38.846082° N, 120.017746° S

FREEWAY

Highways 89 and 50

CATEGORY

Caltrans Maintenance Station

SITE DESCRIPTION

Caltrans Maintenance Station on SR-89
and 1.5 miles from US-50

ZONING

Commercial

LOT SIZE

10 acres

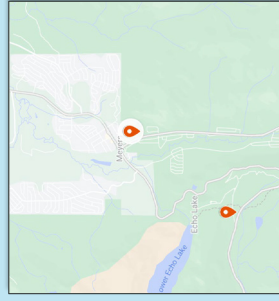
MEGAREGION WORKING GROUP
MEMBER AGENCY

SACOG

ELECTRIC UTILITY

Liberty Utilities

REGIONAL MAP



CHARGING INFRASTRUCTURE

- Up to two DCFC stations with 350 kW
- no stalls for medium- and heavy-duty EV charging (possibly more if only medium-duty vehicles)
- Total power supply needed: up to 350 kW

Conceptual Equipment Layout



Electric Grid Considerations

- Installing one dual-head DCFC stations with a total power output of 350 kW and providing appropriate site lighting would result in a total estimated site load of 397 kW.
- Site voltage of 480 V with a service size of 1,200 A is recommended
- Available capacity:
 - Local distribution circuit: Circuit load projections are not available for this site, ~0 MW of estimated available circuit capacity
 - Local substation bank: Substation bank loading projections are not available for this site, ~0 MW of estimated available capacity
- Utility upgrades:
 - Customer costs for utility upgrades estimated at \$65k-\$90k
 - Developers with site loads exceeding 4 MW are advised to perform a preliminary load study with Liberty Utilities to understand cost and schedule of necessary upgrades
 - Line upgrade projects could be 24-36 months with budgets of \$2-5M
 - Substation upgrades could be 48-60 months with budgets of \$15-30M



H₂ REFUELING INFRASTRUCTURE

- Up to three H₂ refueling dispensers
- Dispensers placed in between pull-through stalls
- Location of hydrogen equipment (liquid/gaseous H₂ storage tanks, pumps, etc.) to be confirmed as part of station design process

Conceptual Equipment Layout



Hydrogen Considerations

- Hydrogen to be delivered and stored on-site
- Smaller power needs to support hydrogen fueling than electric truck charging

ACCESSIBILITY
AND AMENITIES

ACCESSIBILITY

- Site is along SR-89 and within 0.5 mi of US-50.
- Frontage roads are accessible to tractors with 40' trailers
- Site ingress/egress is designed to meet the needs of heavy-duty trucks. Conceptual designs are prioritized for trucks with up to 4 axles and a single trailer.
- Need to account for snow removal and storage.

CURRENT AND
POTENTIAL
AMENITIES

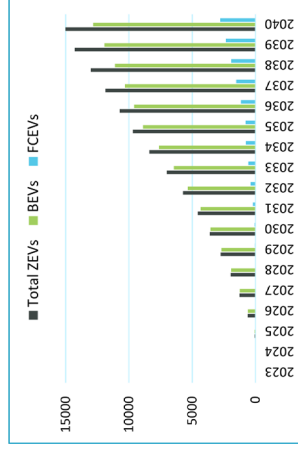
- Not a public location. Initially, site will support Caltrans and potentially other State of California and US Forest Service vehicles. Could be expanded to goods movement later

STATION NEEDS

PROJECTED ZEVS FOR GOODS MOVEMENT

The projected number of ZEV trucks for freight and goods movement, including agriculture, in South Lake Tahoe. This includes trucks that have terminals in South Lake Tahoe and estimated trucks that visit South Lake Tahoe businesses, including farms and ranches, daily.

Projected Number of Resident and Daily Transient ZEV Trucks:



Source: Frontier Energy

POTENTIAL USERS

USERS WITHIN 5 MILES	MHD VEHICLES
LONG-HAUL TRUCKING	17 trucks at 3+ companies
AGRICULTURAL TRUCKING	100 trucks at 4 businesses
DOUGLAS COUNTY	45 trucks
LIBERTY UTILITIES	45 trucks
SOUTH LAKE TAHOE PUBLIC UTILITY DISTRICT	45 trucks
UPS	10 MHD vehicles
TAHOE SAND & GRAVEL	10 MHD vehicles
Source: Volgen Prosperifleet	

ESTIMATED DAILY VMT	WITHIN 1 MILE OF SITE	WITHIN 5 MILES OF SITE
TOTAL VMT	60,900	401,900
FREIGHT/TRUCK VMT	1,700	13,300
	2.8%	3.3%
FREIGHT/TRUCK VMT 65+ MILE TRIPS	800	5,100
	47.1%	38.3%

Source: Replica



2243 CORNELIAN DR, SOUTH LAKE TAHOE, CA 96150

ADDRESS

2243 Cornelian Dr
South Lake Tahoe, CA 96150

COORDINATES

38.846082° N, 120.017746° S

FREEWAY

Highways 89 and 50

SITE DESCRIPTION

Caltrans Maintenance Station on SR-89 and US-50.

ZONING

Commercial

POTENTIAL FUNDING AGENCIES

California Energy Commission
California Transportation Commission
Joint Office of Department of Energy and Department of Transportation
PG&E

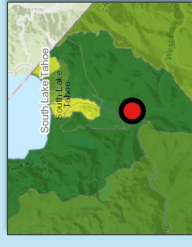
ELECTRIC UTILITY

Liberty Utilities

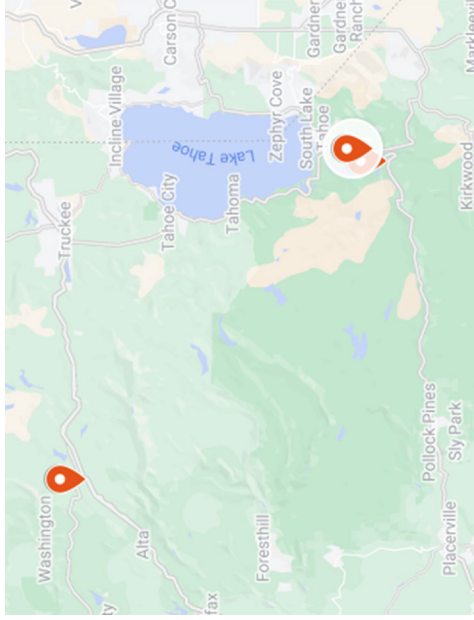
LOCAL ENGAGEMENT

Caltrans District 3
El Dorado County Chamber of Commerce
El Dorado Hills Community Services District
Lake Tahoe South Shore Chamber of Commerce
Tahoe Regional Planning Agency (TRPA)

CALENVIROSCREEN MAP



LOCATION COMPARED TO PLANNED AND PROPOSED STATIONS



POTENTIAL BUSINESS MODELS

Caltrans controls this location, and it is not open to other entities. It is, however, less than one mile from agencies that include Cal Fire, Caltrans, Department of Food and Agriculture, Department of Fish and Wildlife, the U.S. Forest Service, and USPS. Providing ZEV fuel at this location could enable a faster and more cost-effective transition to ZEVs for several agencies.

CO-LOCATED STATION

Caltrans builds or partners with a private developer to build a ZEV station on its land for its fleet, which can include offroad equipment. The station is available 24/7 to the Caltrans fleet and potentially selected other agencies' fleets.

As Caltrans gains operational experience and develops policies for shared fueling, Caltrans could either make the site available to pre-selected users or move the fence to allow public access while maintaining available for fleet vehicles with separate EVSE/hydrogen dispensers in the fleet-only area.

If paired with energy storage or a microgrid, this site could also provide resiliency to Caltrans and other state agencies during a wide-spread or long-term power outage.

LOCAL PARTNERS

- PERMITS:** City of South Lake Tahoe for building permits and business license. El Dorado AQMD for Authority to Construct. TRPA review may be required if building the fuel island on an unpaved part of the property.
- CEQA:** This is developed land and may not require CEQA or NEPA if ground disturbance is minimal.
- ROADWAY:** This site is an existing maintenance station. If Caltrans decides to extend access to other vehicles, the site will need a wider driveway or secondary access. Contact City of South Lake Tahoe Development Services.
- HYDROGEN SETBACK:** This site is narrow and will require careful engineering for hydrogen storage. Contact CAL FIRE and GO-Biz.
- ELECTRICAL:** This site will require electrical upgrades for DCFC. Contact Liberty Utilities.

LOCAL ENGAGEMENT

OUTREACH FORMATS:

- Leveraging existing public meetings such as those held by the El Dorado County Board of Supervisors, City of South Lake Tahoe City Council, Tahoe Transportation District, Tahoe Regional Planning Agency, and SSTMA.
- Organizing in-person events, emphasizing the value of face-to-face interactions.
- Target community groups in the unincorporated areas like Meyers for stakeholder engagement meetings

EVENTS FOR DISCUSSION:

- Participating in an electric vehicle conference scheduled for August 22nd at the South Lake Tahoe event center.
- Engaging the community during local events such as Earth Day, bike & ski swaps, farmers markets, and city council meetings.

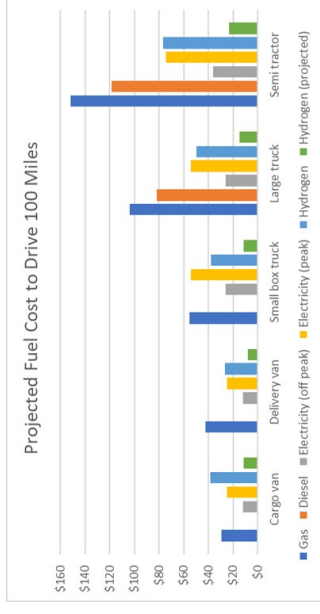
ORGANIZATIONS TO ENGAGE:

- Tahoe Transportation District, Tahoe Regional Planning Agency for insights on regional transportation and planning.
- Local leaders such as Bonnie Turnbull (LTUSD School Board member), John Friedrich (CLST Council member), and Sara Letton (CSLT Sustainability Coordinator) for their roles in education, local governance, and sustainability initiatives.

ECONOMIC IMPACTS

Filling with off-peak electricity or hydrogen will save money compared to filling with traditional fuels. It will be important to levelized the cost of electricity across utilities and times of day so that operators can have more certainty.

The transition to ZEV fuel will greatly reduce state and local tax revenue. Local governments need to start planning to understand the impact.



Gas and diesel price includes state and federal excise tax, state and local sales tax, cost of fuel, overhead and profit. Electricity price includes cost of fuel. Hydrogen price includes state and local sales tax, cost of fuel.

41975 NYACK RD, EMIGRANT GAP, CA 95715

ADDRESS

41975 Nyack Road
Emigrant Gap, CA 95715

COORDINATES

39.292875° N, 120.679781° S

FREEWAY

Highways 80 and 20

CATEGORY

Existing parking lot and building

SITE DESCRIPTION

The site is an existing parking lot with convenient highway access to I-80 and SR-20.

ZONING

Commercial

LOT SIZE

1.95 acres

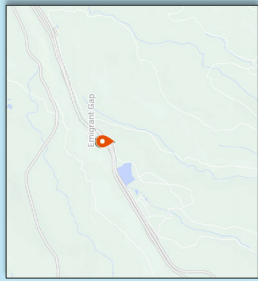
MEGAREGION WORKING GROUP
MEMBER AGENCY

SACOG

ELECTRIC UTILITY

PG&E

REGIONAL MAP



POSSIBLE TECHNICAL SPECIFICATIONS



CHARGING INFRASTRUCTURE

- Up to six DCFC stations with 350 kW
- Six pull-through stalls for medium- and heavy-duty EV charging (possibly more if only medium-duty vehicles)
- Total power supply needed: up to 1,050 kW

Conceptual Equipment Layout



Electric Grid Considerations

- Installing three dual-head DCFC stations with a total power output of 350 kW each and providing appropriate site lighting would result in a total estimated site load of 1,060 kW.
- Site voltage of 480 V with a service size of 2,000 A is recommended

• Available capacity:

- Local distribution circuit: PG&E circuit load projections indicate 1.42 MW of estimated available circuit capacity
- Local substation bank: PG&E substation bank loading projections indicate 0 MW of estimated available capacity

• Utility upgrades:

- Necessary utility upgrades at this site expected to require 2-3 years
- Customer costs for utility upgrades estimated at \$120k-\$180k
- Developers with site loads exceeding 4 MW are advised to perform a preliminary load study with PG&E to understand cost and schedule of necessary upgrades
- Line upgrade projects could be 24-36 months with budgets of \$2-5M
- Substation upgrades could be 48-60 months with budgets of \$15-30M

or

H₂ REFUELING INFRASTRUCTURE

- Up to four H₂ refueling dispensers
- Dispensers placed in between pull-through stalls
- Location of hydrogen equipment (liquid/gaseous H₂ storage tanks, pumps, etc.) to be confirmed as part of station design process

Conceptual Equipment Layout



Hydrogen Considerations

- Hydrogen to be delivered and stored on-site
- Smaller power needs to support hydrogen fueling than electric truck charging

ACCESSIBILITY
AND AMENITIES

ACCESSIBILITY

- Site is along I-80.
- Existing truck stop and authorized truck parking adjacent to the site are accessible to tractors with 40' trailers
- Site ingress/egress meets the needs of heavy-duty trucks. Conceptual designs are prioritized for trucks with up to 4 axles and a single trailer.
- Need to account for snow removal and storage.

CURRENT AND
POTENTIAL
AMENITIES

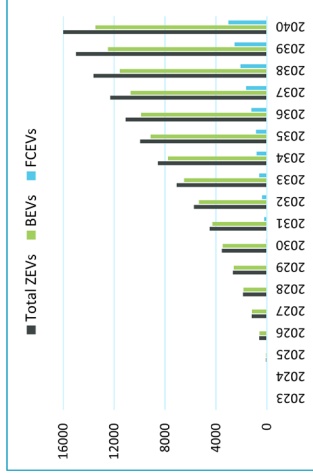
- Existing: gas station with convenience store, sparse street lighting, truck repair shop (0.3 mi)
- Recommended: lighting, Wi-Fi service

STATION NEEDS

PROJECTED ZEVS FOR GOODS MOVEMENT

The projected number of ZEV trucks for freight and goods movement in Emigrant Gap. This includes trucks that have terminals in Emigrant Gap and estimated trucks that visit Emigrant Gap businesses daily.

Projected Number of Resident and Daily Transient ZEV Trucks:



Source: Frontier Energy

POTENTIAL USERS

USERS WITHIN 5 MILES	MHD VEHICLES
LONG-HAUL TRUCKING	45 trucks at 1+ companies
NEVADA IRRIGATION DISTRICT	200 trucks
ROBINSON ENTERPRISES	200 trucks

Source: Valgren ProsserFleet

ESTIMATED DAILY VMT OF SITE	WITHIN 1 MILE OF SITE	WITHIN 5 MILES
TOTAL VMT	94,300	522,200
FREIGHT/TRUCK VMT	9,100	45,100
FREIGHT/TRUCK VMT 65+ MILE TRIPS	7,000	34,900
	76.9%	77.4%

Source: Replicia

California's Advanced Clean Fleets (ACF) regulation applies to "priority fleets"—entities that operate or contract to operate 50 or more trucks in California or operator or contract to operate at least one truck and have gross revenues of \$50 million or more. Starting on January 1, 2024, 100% of trucks added to a priority fleet must be a zero-emission truck.

ACF also applies to government fleets and requires that 50% of medium- and heavy-duty vehicles added to the fleet during 2024-2026 are ZEVs and 100% are ZEV in 2027.

California's Advanced Clean Trucks regulation requires that truck manufacturers and dealers sell an increasing number of ZEVs each year.

These two regulations, along with US EPA Heavy-Duty GHG Emission Standards, will result in a rapid increase in the number of battery and fuel cell electric trucks starting in 2026. By 2035, all new trucks will require charging stations or hydrogen stations.

I-80 is the main route from Nevada to Oakland/San Francisco. It is 115 miles from Reno, NV, to Roseville mostly through the protected lands of Tahoe National Forest. Most of the land near the highway is unsuitable for building. Emigrant Gap is one of the few places that offers fuel along this route and is the designated waiting area for trucks during snowstorms and other road closures. It is an essential location for ZEV fuel and this station has room enough to support hydrogen, DCFC, and overnight slow charging for trucks.

41975 NYACK RD, EMIGRANT GAP, CA 95715

ADDRESS

41975 Nyack Road
Emigrant Gap, CA 95715

COORDINATES

39.292875° N, 120.679781° S

SITE DESCRIPTION

The site is an existing parking lot with convenient highway access to I-80 and SR-20.

ZONING

Commercial

POTENTIAL FUNDING AGENCIES

California Energy Commission
California Transportation Commission
Joint Office of Department of Energy and Department of Transportation
USDA
PG&E

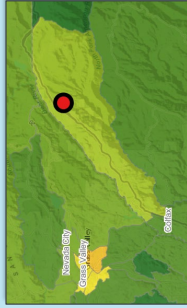
ELECTRIC UTILITY

PG&E

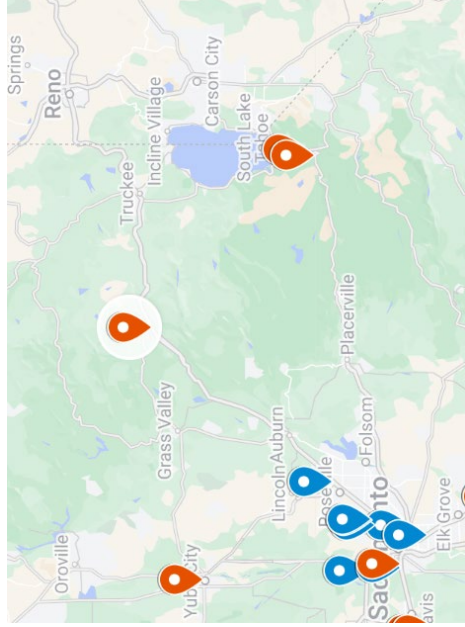
LOCAL ENGAGEMENT

Truckee Chamber of Commerce
Truckee Donner Land Trust
Truckee Donner Public Utility District

CALENVIROSCREEN MAP



LOCATION COMPARED TO PLANNED AND PROPOSED STATIONS



Blue pin: Planned and proposed ZEV fuel stations

Red pin: Megaregion identified location

POTENTIAL BUSINESS MODELS

This location is an authorized truck parking lot adjacent to an existing gas station. It could potentially host DCFC in the parking lot and a hydrogen island near the existing gas station.

PUBLIC STATION

Private development by a commercial fleet user or station developer using State of California or federal grants, IRS tax credits, and incentive programs for a public station. Most users will be long-haul drivers traveling between Nevada and California.

OVERNIGHT PARKING

During winter storms, Nyack Road is typically the point at which I-80 is closed and trucks park for hours (or days). This site improvements like lighting and shore-power electrical hookups for long-duration stays.

LIGHT DUTY

Currently, this site has an EVgo charging station that is not working. Providing a fuel island and/or sharing charging stations with LDVs will create an additional benefit for travelers that use I-80.

LOCAL PARTNERS

PERMITS: Placer County for building permits and business license. Placer County APCD for Authority to Construct.

CEQA: This is an existing parking lot and may require CEQA, and NEPA if federally funded.

ROADWAY: This site is designed for truck traffic and does not require improvements. The parking lot should be resurfaced during construction.

HYDROGEN SETBACK: This site has sufficient room for hydrogen storage. Contact CAL FIRE and GO-Biz.

ELECTRICAL: This site will require electrical upgrades for DCFC. Contact PG&E.

LOCAL ENGAGEMENT

LOCAL ORGANIZATIONS

Emigrant Gap is an unpopulated area with no residents and few local businesses. The area around this location has hiking trails, campgrounds, and other outdoor activities.

Engaging with the U.S. Forest Service and California Department of Fish & Game, and operators of private campgrounds and outdoor guides can identify opportunities to expand electrification beyond goods movement.

LOCAL OUTREACH

Many respondents from the Emigrant Gap area view the project as an exciting opportunity for local investment and modernization, while others are concerned about the impacts of winter weather and potential disruptions to the already challenging traffic conditions on I-80.

Key suggestions from the feedback include a strong emphasis on thorough planning to address the unique challenges posed by local weather and traffic conditions to avoid exacerbating existing issues. Engaging local experts in traffic management, environmental impact, and sustainable development is considered essential for successfully implementing the project.

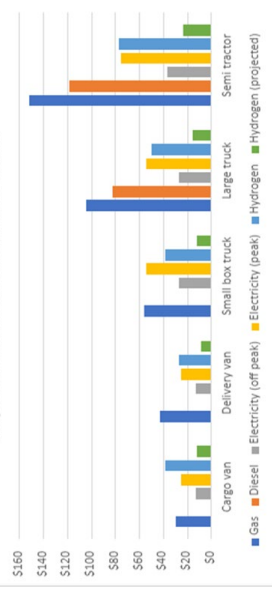
Overall, there is a desire for the project to not only focus on technological advancements but also to ensure it serves the community's needs and respects the environmental constraints of the region.

ECONOMIC IMPACTS

Filling with off-peak electricity or hydrogen will save money compared to filling with traditional fuels. It will be important to levelized the cost of electricity across utilities and times of day so that operators can have more certainty.

The transition to ZEV fuels will greatly reduce state and local tax revenue. Local governments need to start planning to understand the impact.

Projected Fuel Cost to Drive 100 Miles



Gas and diesel price includes state and federal excise tax, state and local sales tax, cost of fuel, overhead and profit. Electricity price includes cost of fuel. Hydrogen price includes state and local sales tax, cost of fuel.

8308 PEDRICK RD, DIXON, CA 95620

ADDRESS
8308 Pedrick Rd
Dixon, CA 95620

COORDINATES
38.471262° N, 121.803649° S

FREEWAY
Interstate 80 and Highway 113

CATEGORY
Existing business

SITE DESCRIPTION
Paved lot that is a distribution center for agriculture. Owner wants to a CaaS station.

ZONING
Industrial

LOT SIZE
13.95 acres

MEGAREGION WORKING GROUP MEMBER AGENCY
SACOG

ELECTRIC UTILITY
PG&E

REGIONAL MAP




POSSIBLE TECHNICAL SPECIFICATIONS


**CHARGING INFRASTRUCTURE**

- Up to six DCFc stations with 350 kW
- Six pull-through stalls for medium- and heavy-duty EV charging (possibly more if only medium-duty vehicles)
- Total power supply needed: up to 1,050 kW

**Conceptual Equipment Layout**

**Electric Grid Considerations**

- Installing three dual-head DCFc stations with a total power output of 350 kW each, a ~15,000-sqft. convenience store with an estimated building load of 130 kW, and providing appropriate site lighting would result in a total estimated site load of about 1,270 kW.
- Site voltage of 480 V with a service size of 2,000 A is recommended
- Available capacity:**
 - Local distribution circuit:** PG&E circuit load projections indicate 0 MW of estimated available circuit capacity
 - Local substation bank:** PG&E substation bank loading projections indicate 7.4 MW of estimated available capacity
- Utility upgrades:**
 - Customer costs for utility upgrades estimated at \$120k-\$180k
 - Necessary utility upgrades at this site expected to require 2-3 years
 - Line upgrade projects could be 24-36 months with budgets of \$2-5M
 - Substation upgrades could be 48-60 months with budgets of \$15-30M

**Conceptual Equipment Layout**

**H₂ REFUELING INFRASTRUCTURE**

- Up to four H₂ refueling dispensers
- Dispensers placed in between pull-through stalls
- Location of hydrogen equipment (liquid/gaseous H₂ storage tanks, pumps, etc.) to be confirmed as part of station design process

**Conceptual Equipment Layout**

ACCESSIBILITY AND AMENITIES

ACCESSIBILITY

- Site is close to I-80 (1 mi) and SR-113 south (1.5 mi).
- Frontage roads are generally accessible to tractors with 40' trailers.
- Site ingress/egress can be designed to meet the needs of heavy-duty trucks. Conceptual designs are prioritized for trucks with up to 4 axles and a single trailer.

CURRENT AND POTENTIAL AMENITIES

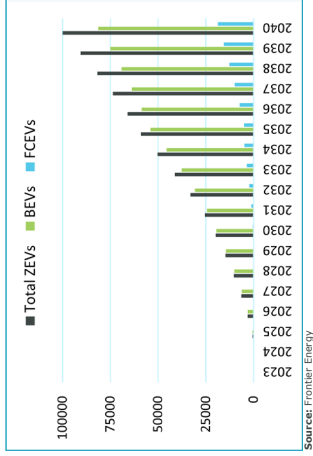
- Existing: solar-PV on adjacent buildings (if included in potential land purchase)
- Recommended: lighting, convenience store, restrooms, Wi-Fi service

STATION NEEDS

PROJECTED ZEVS FOR GOODS MOVEMENT

The projected number of ZEV trucks for freight and goods movement, including agriculture, in Dixon. This includes trucks that have terminals in Dixon and estimated trucks that visit Dixon businesses, including farms and ranches, daily.

Projected Number of Resident and Daily Transient ZEV Trucks:



POTENTIAL USERS

USERS WITHIN 5 MILES		MHD VEHICLES	
TRUCKING		7,501 trucks at 49+ companies	
FARMERS		150 trucks at 11 businesses	
CAMPBELL SOUP		30 trucks	
DIXON HAY COMPANY		20 trucks	
GLT-CO HAY		20 trucks	
BUTTON TRANSPORTATION		100 trucks	
GOLD STAR FOODS		50+ trucks daily	
Source: Valgren Prosper/Reet			
ESTIMATED DAILY VMT		WITHIN 1 MILE OF SITE WITHIN 5 MILES OF SITE	
TOTAL VMT		196,700	1,716,800
FREIGHT/TRUCK VMT		22,700	188,600
		11.5%	11.0%
FREIGHT/TRUCK VMT 65+ MILE TRIPS		6,400	53,100
		28.2%	28.2%
Source: Replica			

Hydrogen Considerations

- Hydrogen to be delivered and stored on-site
- Smaller power needs to support hydrogen fueling than electric truck charging

8308 PEDRICK RD, DIXON, CA 95620

ADDRESS

8308 Pedrick Rd
Dixon, CA 95620

COORDINATES

38.471262° N, 121.803649° S

FREEWAY

Interstate 80 and Highway 113

SITE DESCRIPTION

The site is an existing business with highway access to SR-113 and I-80.

ZONING

Industrial

POTENTIAL FUNDING AGENCIES

California Energy Commission
California Transportation Commission
Joint Office of Department of Energy and Department of Transportation
USDA
PG&E

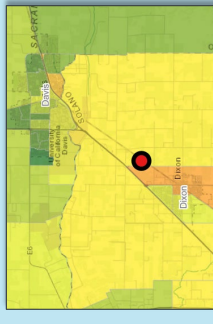
ELECTRIC UTILITY

PG&E

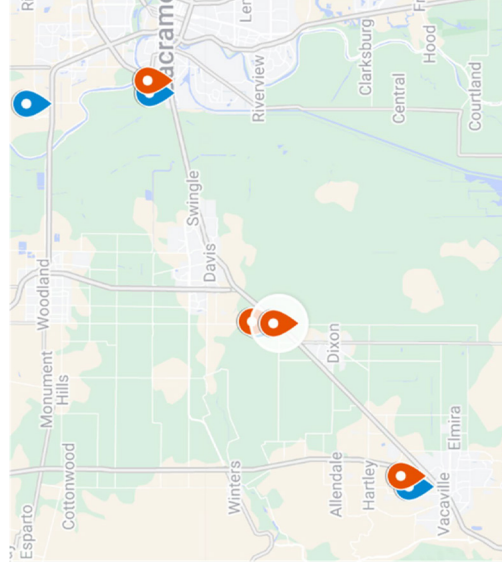
LOCAL ENGAGEMENT

City of Dixon Economic Development
Department Dixon Chamber of Commerce
Solano County Community Action Partnership
Sustainable Solano

CALENVIROSCREEN MAP



LOCATION COMPARED TO PLANNED AND PROPOSED STATIONS



Blue pin: Planned and proposed ZEV fuel stations

Red pin: Megaregion identified location

POTENTIAL BUSINESS MODELS

This location covers over 16 acres near existing baseload fleets that are mostly farmers, distributors, and food processors. The site has a planned renovation to expand warehouse and offer truck parking for the ag industry. The owner would like to offer charging to his customer.

CHARGING AS A SERVICE:

The site owner wants to partner with a developer to offer CaaS that will include overnight parking + charging, and fast charging for trucks that make multiple trips to Port of Oakland and rail ports.

DEMAND MANAGEMENT/ENERGY STORAGE:

The site is being designed to have extensive solar capabilities and could include energy storage. The owner will provide the land for an operator to manage the energy, which could include selling fuel to drivers, participates in demand management, and/or the CASIO day-ahead market.

PUBLIC FUELING:

The owner is also interested in partnering with a company to produce and sell hydrogen on site, and potentially using excess hydrogen as energy storage.

LOCAL PARTNERS

PERMITS: City of Dixon for building permits and business license, Yolo-Solano AQMD for Authority to Construct.

ROADWAY: This is an existing business will have a configuration. Pedrick Road supports heavy truck traffic but is a very narrow two-lane road. This will require a traffic study.

HYDROGEN SETBACK: This site does not have any adjacent structures and will have sufficient space for hydrogen production and storage. Contact CAL FIRE and GO-Biz.

ELECTRICAL: This site will require electrical upgrades for DFC. Contact PG&E.

LOCAL ENGAGEMENT

OUTREACH FORMATS:

- Posting on the Dixon 411 Facebook Group or NextDoor App to reach a broad segment of the community.
- Reaching out to the Solano County Farm Bureau for engagement with the agricultural community.
- Hosting community workshops at the Dixon Public Library to engage older residents and those who may not attend city council meetings.

EVENTS FOR DISCUSSION:

- City Council, Planning Commission, or Special District Board Meetings as formal venues to discuss the project.
- Monthly meetings of the Solano County Farm Bureau, specifically the first Monday of every month.
- The annual Lambtown Festival, which could provide a unique opportunity for project discussion due to its local significance and high community involvement.

ORGANIZATIONS TO ENGAGE:

- Dixon Resource Conservation District (RCD) Board of Directors.
- Dixon City Council and Board of Supervisors for policy and local government involvement.
- The Solano Land Trust, which could provide insights on managing environmental impacts due to its focus on preserving agricultural land and open spaces

LOCAL OUTREACH

Dixon residents acknowledge the benefits of transitioning to cleaner transportation but are concerned about increased traffic and the strain on local infrastructure.

They are also worried that adding a ZEV fueling station could disrupt the rural character of the community. They also recognized possible economic opportunities and job creation.

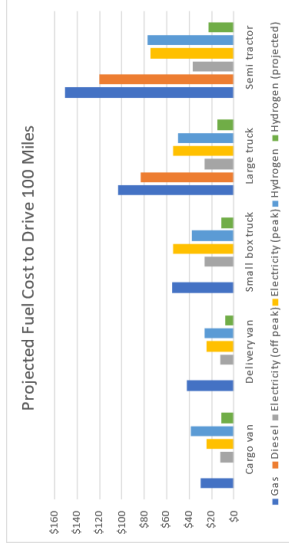
Community members cited the need for effective traffic management, infrastructure enhancements to support the increased vehicle load, and measures to ensure that the development does not detract from the local environment's aesthetic.

This site is specific to the needs of agriculture in general and hay growers in particular. It will be important to work with the property owners and get feedback from nearby farmers and potential customers before construction.

ECONOMIC IMPACTS

Filling with off-peak electricity or hydrogen will save money compared to filling with traditional fuels. It will be important to levelized the cost of electricity across utilities and times of day so that operators can have more certainty.

The transition to ZEV fuels will greatly reduce state and local tax revenue. Local governments need to start planning to understand the impact.



Gas and diesel price includes state and federal excise tax, state and local sales tax, cost of fuel, overhead and profit. Electricity price includes cost of fuel. Hydrogen price includes state and local sales tax, cost of fuel.

Stockton ZEV Fueling Site

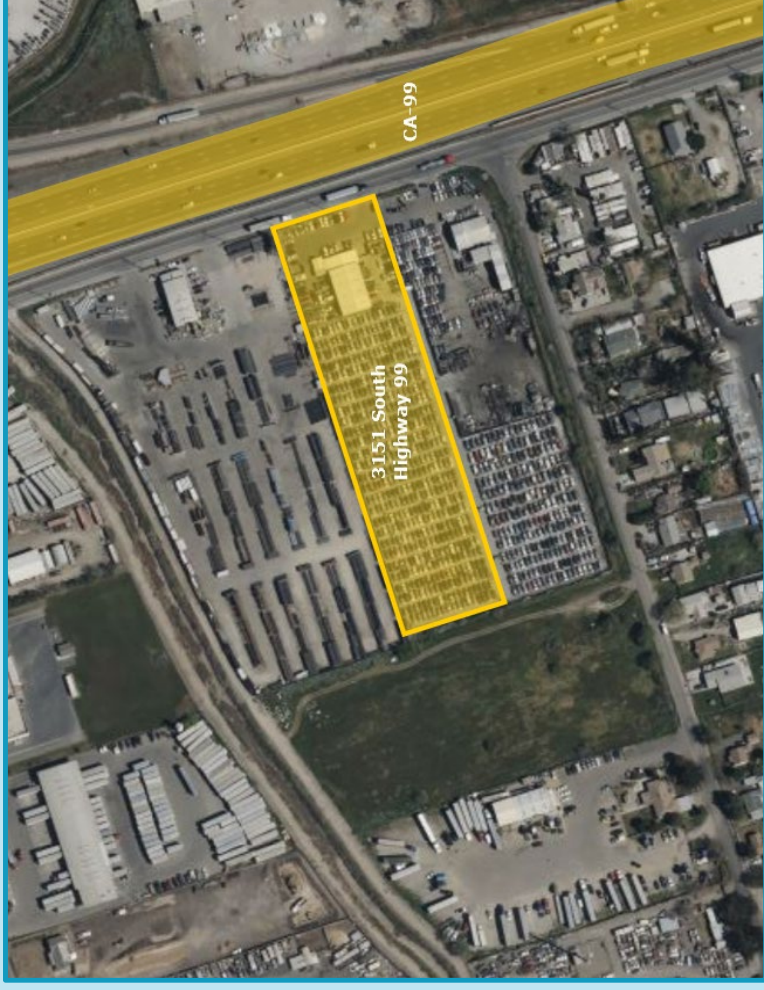
ADDRESS
3151 CA-99
Stockton, CA 95205

ZONING
Industrial

PROPERTY
3 acres
Paved lot for sale

ACCESS TO
Highways 99 and 4

POTENTIAL USERS
Overnight parking for
drayage operators
Public charging/fueling for
pass-through truckers



Suitable for DCFC or hydrogen fueling
Near trucking operators and distribution centers
Easy access from CA-99

3151 SOUTH HIGHWAY 99, STOCKTON, CA 95205

POSSIBLE TECHNICAL SPECIFICATIONS

ADDRESS
3151 CA-99
Stockton, CA 95205

COORDINATES
Near 37.933885° N, 121.234128° S

FREEWAY
Highways 99 and 4

CATEGORY
Existing parking lot for sale

SITE DESCRIPTION
Site is a paved lot that is for sale ½ mile from Mariposa Road exit on Highway 99, and 1 mile from SR-4.

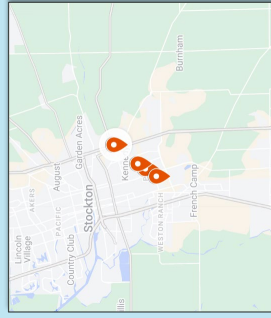
ZONING
Industrial

LOT SIZE
3 acres

MEGAREGION WORKING GROUP MEMBER AGENCY
San Joaquin Council of Governments

ELECTRIC UTILITY
PG&E

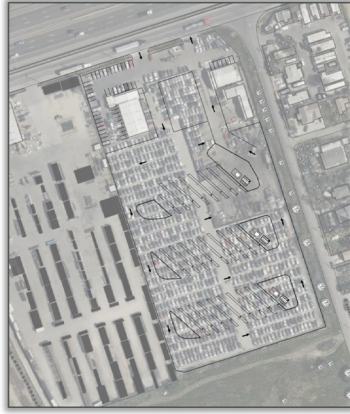
REGIONAL MAP



CHARGING INFRASTRUCTURE

- Up to 20 DCFC stations with 350 kW
- 20 pull-through stalls for medium- and heavy-duty EV charging (possibly more if only medium-duty vehicles)
- Total power supply needed: up to 3,500 kW

Conceptual Equipment Layout



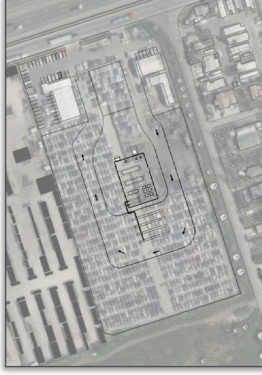
Electric Grid Considerations

- Installing 20 dual-head DCFC stations with a total power output of 350 kW each and providing appropriate site lighting would result in a total estimated site load of 3,513 kW.
- Site voltage of 480 V with a service size of 2x3,000 A is recommended
- Available capacity:**
 - Local distribution circuit:** PG&E circuit load projections indicate 0.8 MW of estimated available circuit capacity
 - Local substation bank:** PG&E substation bank loading projections indicate 0 MW of estimated available capacity
- Utility upgrades:**
 - Necessary utility upgrades at this site expected to require more than five years
 - Developers with site loads exceeding 4 MW are advised to perform a preliminary load study with PG&E to understand cost and schedule of necessary upgrades
 - Line upgrade projects could be 18-24 months with budgets of \$2-5M
 - Substation upgrades could be 48-60 months with budgets of \$15-30M

H₂ REFUELING INFRASTRUCTURE

- Up to four H₂ refueling dispensers
- Dispensers placed in between pull-through stalls
- Location of hydrogen equipment (liquid/gaseous H₂ storage tanks, pumps, etc.) to be confirmed as part of station design process

Conceptual Equipment Layout



Hydrogen Considerations

- Hydrogen to be delivered and stored on-site
- Smaller power needs to support hydrogen fueling than electric truck charging

ACCESSIBILITY AND AMENITIES

ACCESSIBILITY

- Site is close to SR-99.
- Frontage roads to site are currently not all accessible to tractors with 40' trailers
- Site ingress/egress may not be able to be designed to meet the needs of heavy-duty trucks.
- Conceptual designs are prioritized for trucks with up to 4 axles and a single trailer.
- Site has many automotive and truck related business, and a small number of older homes nearby

POTENTIAL AMENITIES

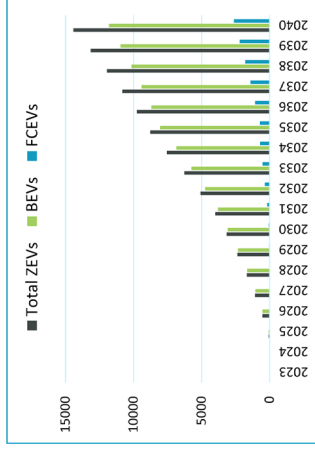
- Existing: none
- Recommended: street and site lighting, restrooms, Wi-Fi service
- Currently an auto dismantler. Has a small building and fenced lot.

STATION NEEDS

PROJECTED ZEVS FOR GOODS MOVEMENT

The projected number of ZEV trucks for freight and goods movement in Stockton. This includes trucks that have terminals in Stockton and estimated trucks that visit Stockton businesses daily.

Projected Number of Resident and Daily Transient ZEV Trucks:



Source: Frontier Energy

POTENTIAL USERS

USERS WITHIN 5 MILES	MHD VEHICLES
LONG-HAUL TRUCKING	1,000 trucks at 30+ companies
AGRICULTURAL TRUCKING	300 trucks at 13 businesses
DIAMOND TRANSPORTATION	100 trucks
BLS LOGISTICS	75 trucks
OAK HARBOR FREIGHT	100 trucks daily
ABF FREIGHT	50 trucks
FOODLINER INC	50+ trucks daily
CALCIEF FOODS	50+ trucks daily
Source: Valgren ProsperFleet	

ESTIMATED DAILY VMT OF SITE	WITHIN 1 MILE OF SITE	WITHIN 5 MILES OF SITE
TOTAL VMT	347,000	4,247,900
FREIGHT/TRUCK VMT	41,400	418,800
	11.9%	9.9%
FREIGHT/TRUCK VMT	14,500	137,900
65+ MILE TRIPS	35.0%	32.9%
Source: Replicia		

NEAR 3151 SOUTH HIGHWAY 99, STOCKTON, CA 95205

ADDRESS
Near 3151 CA-99
Stockton, CA 95205

FREEWAY
Highways 99 and 4

CATEGORY
Paved parking lot, currently an auto dismantler

ZONING
Industrial

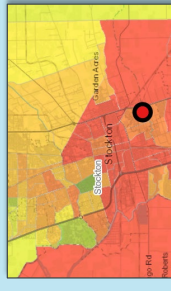
LOT SIZE
3 acres

POTENTIAL FUNDING AGENCIES
California Energy Commission
California Transportation Commission
Joint Office of Department of Energy and Department of Transportation
PG&E

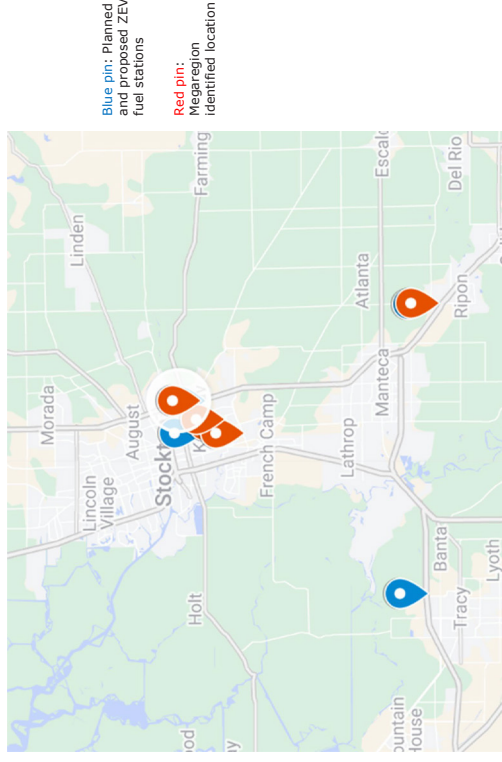
ELECTRIC UTILITY
PG&E

LOCAL ENGAGEMENT
San Joaquin County Hispanic Chamber of Commerce
Stockton Chamber of Commerce
Stockton Economic Empowerment Demonstration (SEED)
Stockton Strong
City of Stockton Economic Development Department
United Way of San Joaquin County

CALENVIROSCREEN MAP



LOCATION COMPARED TO PLANNED AND PROPOSED STATIONS



POTENTIAL BUSINESS MODELS

This location is currently a pick-and-pull lot. It is a paved area surrounded by security fencing with a small building and public parking area in front.

CHARGING AS A SERVICE

Private development by a station developer in partnership with one or more fleet user using State of California or federal grants, IRS tax credits, and incentive programs. Potential users include the almost 30 trucking firms in the immediate area and the owner/operators that currently rent parking spaces from the self-storage and truck repair businesses.

PUBLIC CHARGING

Private development by a station developer using State of California or federal grants, IRS tax credits, and incentive programs. A charging or fueling island near the street could offer fast charging/fueling for drayage trucks and trucks the pickup/drop off at the nearby food and building materials distributors.

LOCAL PARTNERS

PERMITS: City of Stockton for building permits and business license. San Joaquin Valley APCD for Authority to Construct.

ROADWAY: The existing driveway will need to be reconfigured for a truck with a 40-foot trailer. Trucks will need to turn left out of the parking lot to return to the highway. Contact Stockton Community Development Department.

CEQA: Because the current business is a dismantler, and the adjacent business recycles tires, this site may require CEQA when breaking concrete.

HYDROGEN SETBACK: This is a long, deep lot with plenty of space for hydrogen storage. Contact CAL FIRE and GO-Biz.

ELECTRICAL: This site will require electrical upgrades for DFC. Contact PG&E.

LOCAL ENGAGEMENT

OUTREACH FORMATS:

- Hosting multiple community forums in accessible locations and ensuring presentations are available in Spanish.
- Conducting community meetings, ensuring that communication is two-way and accessible, with emphasis on including non-English speakers.
- Using innovative outreach methods to involve diverse community segments, with a focus on transparency regarding economic benefits and concerns.

EVENTS FOR DISCUSSION:

- Setting up informational tables at city hall meetings and events at the Stockton Waterfront.
- Organizing discussions in community centers or parks to facilitate easy access for residents to participate.
- Hosting discussions at business incubators, universities, and public spaces to engage a broad cross-section of the community, including using digital platforms to expand reach and facilitate wider participation.

ORGANIZATIONS TO ENGAGE:

- Engaging community groups, local leaders, and ZEV experts.
- Consulting with traffic specialists and educational experts to ensure the project does not disrupt daily life.
- Collaborating with urban planners, local business alliances, and academic economists to develop a well-rounded strategy that is grounded and forward-thinking.

LOCAL OUTREACH

Stockton community members are both curious and concerned about ZEV fueling stations. Residents expressed enthusiasm about the potential economic benefits and job creation the project might bring, particularly in South Stockton, but worry about impact on local traffic and infrastructure by additional freight activity.

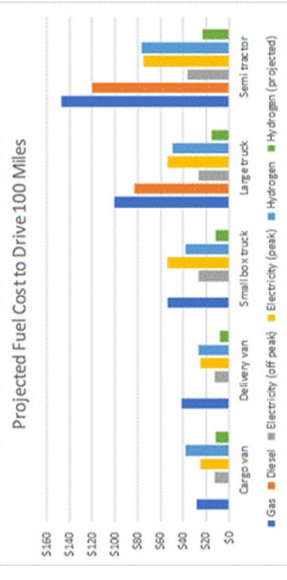
Community members emphasized the need for strategic planning to integrate ZEV stations without disrupting existing traffic patterns and residential areas. They want ZEV projects to demonstrate job creation and environmental improvements.

The Highway 99/Munford Avenue area is mostly trucking, manufacturing, and auto dismantlers. However, a small mobile home park and about 20 houses are on Munford and should be engaged before building on this site.

ECONOMIC IMPACTS

Filling with off-peak electricity or hydrogen will save money compared to filling with traditional fuels. It will be important to levelized the cost of electricity across utilities and times of day so that operators can have more certainty.

The transition to ZEV fuels will greatly reduce state and local tax revenue. Local governments need to start planning to understand the impact.



Gas and diesel price includes state and federal excise tax, state and local sales tax, cost of fuel, overhead and profit. Electricity price includes cost of fuel. Hydrogen price includes state and local sales tax, cost of fuel.

Stockton ZEV Fueling Site

ADDRESS

920 Performance Dr
Stockton, CA 95206

ZONING

Industrial

PROPERTY

4.08 acres
Parking lot
Listed for lease

ACCESS TO

Highways 99 and 4, I-5

POTENTIAL USERS

2,509+ trucks
6+ distribution centers



Suitable for DCFC or hydrogen fueling
Paved lot with 109 trailer positions
Easy access from I-5

920 PERFORMANCE DR, STOCKTON, CA 95206

POSSIBLE TECHNICAL SPECIFICATIONS

ADDRESS

920 Performance Dr
Stockton, CA 95206

COORDINATES

37.891602° N, 121.25518° S

FREEWAY

Highways 99 and 4, and I-5

CATEGORY

Paved parking lot for lease

SITE DESCRIPTION

The site is a parking lot within 1 mile of Hwy 99 and I-5, 5 miles of BNSF railroad, 6 miles of Port of Stockton, and 1 mile from Stockton Metro Airport.

ZONING

Industrial

LOT SIZE

4.08 acres

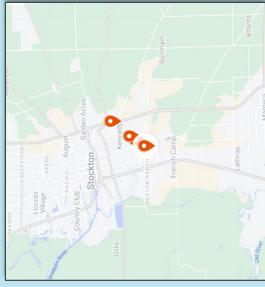
MEGAREGION WORKING GROUP MEMBER AGENCY

SJCOC

ELECTRIC UTILITY

PG&E

REGIONAL MAP



CHARGING INFRASTRUCTURE

- Up to 20 DCF stations with 350 kW
- 20 pull-through stalls for medium- and heavy-duty EV charging (possibly more if only medium-duty vehicles)
- Total power supply needed: up to 4,200 kW

Conceptual Equipment Layout



Electric Grid Considerations

- Installing 10 dual-head DCF stations with a total power output of 350 kW each, a ~15,000-sqft. convenience store with an estimated building load of 150 kW, and providing appropriate site lighting result in an estimated site load of about 3,670 kW.
- Site voltage of 480 V with a service size of about 8,000 A is recommended

Available capacity:

- Local distribution circuit: PG&E circuit load projections are not available for this site. ~0 MW of estimated available circuit capacity

Local substation bank: PG&E

- substation bank loading projections are not available for this site. ~0 MW of estimated available capacity

Utility upgrades:

- Necessary utility upgrades at this site expected to require at least 5 years
- Developers with site loads exceeding 4 MW are advised to perform a preliminary load study with PG&E to understand cost and schedule of necessary upgrades
- Line upgrade projects could be 18-24 months with budgets of \$2-5M
- Substation upgrades could be 48-60 months with budgets of \$15-30M

or

H₂ REFUELING INFRASTRUCTURE

- Up to 6 H₂ refueling dispensers
- Dispensers placed in between pull-through stalls
- Location of hydrogen equipment (liquid/gaseous H₂ storage tanks, pumps, etc.) to be confirmed as part of station design process

Conceptual Equipment Layout



Hydrogen Considerations

- Hydrogen to be delivered and stored on-site
- Smaller power needs to support hydrogen fueling than electric truck charging

ACCESSIBILITY AND AMENITIES

ACCESSIBILITY

- Site is within 1 mi of access to I-5, within 2.5 mi of SR-99, and within 4 mi of SR-4.
- Frontage roads generally accessible to tractors with 40' trailers

- Site ingress/egress can be designed to meet the needs of heavy-duty trucks. Conceptual designs vetted for trucks with up to 4 axles and a single trailer.

CURRENT AND POTENTIAL AMENITIES

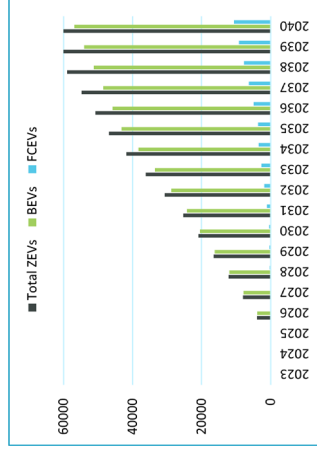
- Existing: up to two restaurants within 5-min walking distance from site, street lighting
- Recommended: on-site convenience store (as shown in conceptual EV charging design) with restrooms, lighting, and Wi-Fi service

STATION NEEDS

PROJECTED ZEVS FOR GOODS MOVEMENT

The projected number of ZEV trucks for freight and goods movement in the Airport Industrial Park. This includes trucks that have terminals and visit businesses within five miles of the industrial park.

Projected Number of Resident and Daily Transient ZEV Trucks:



Source: Frontier Energy

POTENTIAL USERS

USERS WITHIN 5 MILES	MHD VEHICLES
LONG-HAUL TRUCKING	859 trucks at 23+ companies
STOCKTON CITY	1250 trucks
SRI SURGICAL EXPRESS STOCKTON	200 trucks
WILLIAMS TANK LINES	200 trucks
JM EAGLE	50 MHD vehicles
COASTAL PACIFIC FOOD DISTRIBUTION	100 MHD vehicles
C&S WHOLESALE GROCERS, INC.	100 MHD vehicles
AMAZON	200 MHD vehicles

Source: Valjen Proseper/leet

ESTIMATED DAILY VMT	WITHIN 1 MILE OF SITE	WITHIN 5 MILES OF SITE
TOTAL VMT	201,300	1,594,600
FREIGHT/TRUCK VMT	9,300	102,300
	4.6%	6.4%
FREIGHT/TRUCK VMT 65+ MILE TRIPS	900	26,800
	8.6%	26.2%

Source: Replica



920 PERFORMANCE DR, STOCKTON, CA 95206

ADDRESS

920 Performance Dr
Stockton, CA 95206

FREEWAY

Highway 99 and 4, and I-5

DESCRIPTION

4-acre paved parking lot in an industrial park

ZONING

Industrial

POTENTIAL FUNDING AGENCIES

California Energy Commission
California Transportation Commission
Joint Office of Department of Energy and Department of Transportation
PG&E

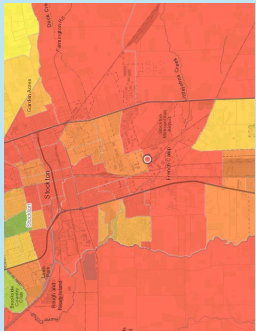
ELECTRIC UTILITY

PG&E

LOCAL ENGAGEMENT

San Joaquin County Hispanic Chamber of Commerce
Stockton Chamber of Commerce
Stockton Economic Empowerment Demonstration (SEED)
Stockton Strong
City of Stockton Economic Development Department
United Way of San Joaquin County

CALENVIROSCREEN MAP



LOCATION COMPARED TO PLANNED AND PROPOSED STATIONS

LOCAL PARTNERS

PERMITS: City of Stockton for building permits and business license, San Joaquin Valley APCD for Authority to Construct.

ROADWAY: The site has gated access from Performance Drive. It doesn't require additional roadway improvements.

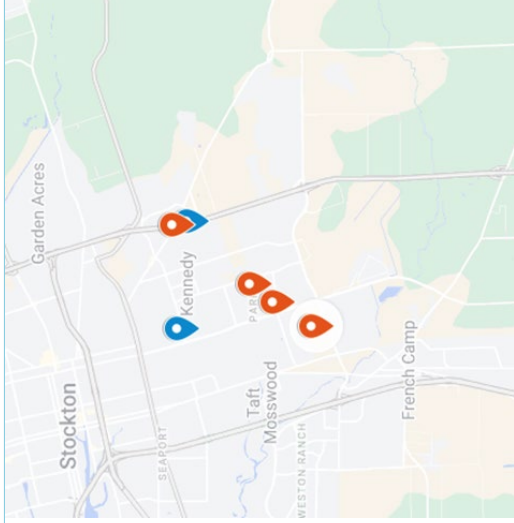
HYDROGEN SETBACK: This site has ample space for hydrogen storage within NFPA and CAL FIRE standards.

ELECTRICAL: This site will require electrical upgrades for DCFC. Contact PG&E.

AIRSPACE: This location is not in the runway path for the Stockton Airport, but coordination with the airport staff and Caltrans is advisable, particularly about lighting.

Blue pins: Planned and proposed ZEV fuel stations

Red pins: Megaregion identified locations



POTENTIAL BUSINESS MODELS

This location is in a growing industrial park near the Stockton Metropolitan Airport. It is already paved and striped for 109 trailer positions and has an area designated for a shower/restroom facility.

PUBLIC STATION:

Private development by a commercial fleet user or station developer using State of California or federal grants, IRS tax credits, and incentive programs for a public station. The entity owns and operates the ZEV fuel depot and is responsible for profit/loss, upkeep, and ancillary services. Potential users include companies and owner/operators that make daily trips between the Ports of Stockton and Oakland, the BNSF Railroad, and between food processors and retail stores.

It could also serve as overnight truck parking/charging for local businesses or long-haul drivers. Satellite images and site visits show trucks parked on Performance Drive and other streets for long periods.

DEMAND MANAGEMENT:

This is a large site with no obstructions and could support a solar array and battery storage. The operator could sell fuel to drivers, participate in PG&E's demand management program, and potentially participate in the CASIO day-ahead market.

LIGHT DUTY:

This is a busy industrial park with many personal owned vehicles and light-duty fleet vehicles. Currently, one public charger is available at a nearby business and others are in the airport parking lot. Providing a fuel island or sharing charging stations with LDVs could create additional baseload.

LOCAL ENGAGEMENT

OUTREACH FORMATS:

- Hosting multiple community forums in accessible locations and ensuring presentations are available in multiple languages, especially Spanish.
- Conducting community meetings, ensuring that communication is two-way and accessible, with emphasis on including non-English speakers.
- Using innovative outreach methods to involve diverse community segments, with a focus on transparency regarding economic benefits and concerns.

EVENTS FOR DISCUSSION:

- Setting up informational tables at city hall meetings and events at the Stockton Waterfront.
- Organizing discussions in community centers or parks to facilitate easy access for residents to participate.
- Hosting discussions at business incubators, universities, and public spaces to engage a broad cross-section of the community, including using digital platforms to expand reach and facilitate wider participation.

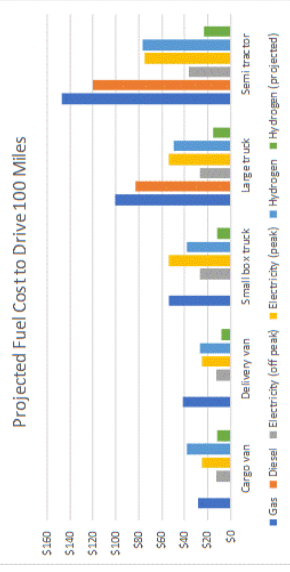
ORGANIZATIONS TO ENGAGE:

- Engaging community groups, local leaders, and ZEV experts.
- Consulting with traffic specialists and educational experts to ensure the project does not disrupt daily life.
- Collaborating with urban planners, local business alliances, and academic economists to develop a well-rounded strategy that is grounded and forward-thinking.

ECONOMIC IMPACTS

Filling with off-peak electricity or hydrogen will save money compared to filling with traditional fuels. It will be important to levelized the cost of electricity across utilities and times of day so that operators can have more certainty.

The transition to ZEV fuels will greatly reduce state and local tax revenue. Local governments need to start planning to understand the impact.



Gas and diesel price includes state and federal excise tax, state and local sales tax, cost of fuel, overhead and profit. Electricity price is kWh charge only. Hydrogen price includes state and local sales tax, cost of fuel.

South Lake Tahoe ZEV Fueling Site

ADDRESS

20781 US Highway 50
South Lake Tahoe, CA 95735

ZONING

Commercial

PROPERTY

2.36 acres
Partially developed land

ACCESS TO

Highways 50 and 89

POTENTIAL USERS

Pass-through trucking
Motorcoaches
Local businesses
Light-duty vehicles



Suitable for DCFC or hydrogen fueling
Easy access from US-50

20781 US-50, ECHO LAKE, CA 95721

ADDRESS

20781 US HWY 50
South Lake Tahoe, 95721

COORDINATES

38.824093° N, 120.040913° S

FREEWAY

On Highway 50 and near Highway 89

CATEGORY

Partially developed land listed for sale

SITE DESCRIPTION

The site is existing building with convenient highway access to US-50 and SR-89.

ZONING

Commercial

LOT SIZE

2.36 acres

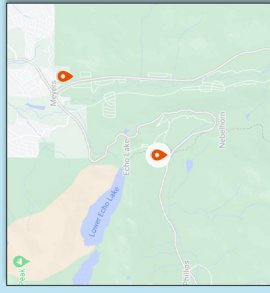
MEGAREGION WORKING GROUP MEMBER AGENCY

SACOG

ELECTRIC UTILITY

PG&E

REGIONAL MAP



POSSIBLE TECHNICAL SPECIFICATIONS



CHARGING INFRASTRUCTURE

- Up to six DCFC stations with 350 kW
- Six pull-through stalls for medium- and heavy-duty EV charging (possibly more if only medium-duty vehicles)
- Total power supply needed: up to 1,050 kW

Conceptual Equipment Layout



Electric Grid Considerations

- Installing three dual-head DCFC stations with a total power output of 350 kW each, a ~5,000-sqft convenience store with an estimated building load of 50 kW and providing appropriate site lighting would result in a total estimated site load of about 1,100 kW.
- Site voltage of 480 V with a service size of 2,000 A is recommended

Available capacity:

- **Local distribution circuit:** PG&E circuit load projections indicate 0.2 MW of estimated available circuit capacity

- **Local substation bank:** no PG&E substation bank loading projections available

Utility upgrades:

- Customer costs for utility upgrades estimated at \$65k-\$90k
- Necessary utility upgrades at this site expected to require 2-3 years
- Line upgrade projects could be 24-36 months with budgets of \$2-5M
- Substation upgrades could be 48-60 months with budgets of \$15-30M

or



H₂ REFUELING INFRASTRUCTURE

- Up to four H₂ refueling dispensers
- Dispensers placed in between pull-through stalls
- Location of hydrogen equipment (liquid/gaseous H₂ storage tanks, pumps, etc.) to be confirmed as part of station design process

Conceptual Equipment Layout



Hydrogen Considerations

- Hydrogen to be delivered and stored on-site
- Smaller power needs to support hydrogen fueling than electric truck charging

ACCESSIBILITY AND AMENITIES

ACCESSIBILITY

- Site is along US-50 and accessible to tractors with 40' trailers from US-50 and a frontage road.
- May require a left-in/left-out lanes on US-50.
- Site is on a slight rise and will need grading.
- Site ingress/egress can be designed to meet the needs of heavy-duty trucks. Conceptual designs are prioritized for trucks with up to 4 axles and a single trailer.
- Need to account for snow removal and storage.

CURRENT AND POTENTIAL AMENITIES

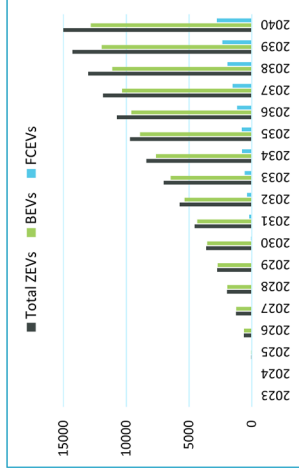
- Existing: none
- Site is an unoccupied small hotel that may be renovated to offer amenities, including overnight apartments.

STATION NEEDS

PROJECTED ZEVS FOR GOODS MOVEMENT

The projected number of ZEV trucks for freight and goods movement to and from South Lake Tahoe. Few goods movement companies are in the Tahoe basin, but many goods movement vehicles drive between Sacramento and South Lake Tahoe businesses daily.

Projected Number of Resident and Daily Transient ZEV Trucks:



Source: Frontier Energy

POTENTIAL USERS

USERS WITHIN 5 MILES	MHD VEHICLES
LONG-HAUL TRUCKING	17 trucks at 3+ companies
DOUGLAS COUNTY	45 trucks
LIBERTY UTILITIES	45 trucks
SOUTH TAHOE PUBLIC UTILITIES DISTRICT	45 trucks
UPS	10 MHD vehicles
TAHOE SAND & GRAVEL INC.	10 MHD vehicles
LONG-HAUL TRUCKING	17 trucks at 3+ companies
DOUGLAS COUNTY	45 trucks
LIBERTY UTILITIES	45 trucks

Source: Valgren ProsserFleet

ESTIMATED DAILY VMT	WITHIN 1 MILE OF SITE	WITHIN 5 MILES OF SITE
TOTAL VMT	95,600	364,700
FREIGHT/TRUCK VMT	2,200	10,100
	2.3%	2.8%
FREIGHT/TRUCK VMT	1,600	5,400
65+ MILE TRIPS	72.7%	53.5%

Source: Kopika

20781 US-50, ECHO LAKE, CA 95721

ADDRESS
20781 US HWY 50
South Lake Tahoe, 95721

COORDINATES
38.824093° N, 120.040913° S

FREEWAY
Highways 50 and 89

SITE DESCRIPTION
The site is existing abandoned building on US-50 and near SR-89.

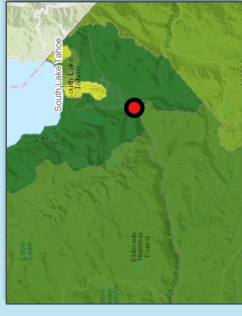
ZONING
Commercial

POTENTIAL FUNDING AGENCIES
California Energy Commission
California Transportation Commission
Joint Office of Department of Energy and Department of Transportation
PG&E

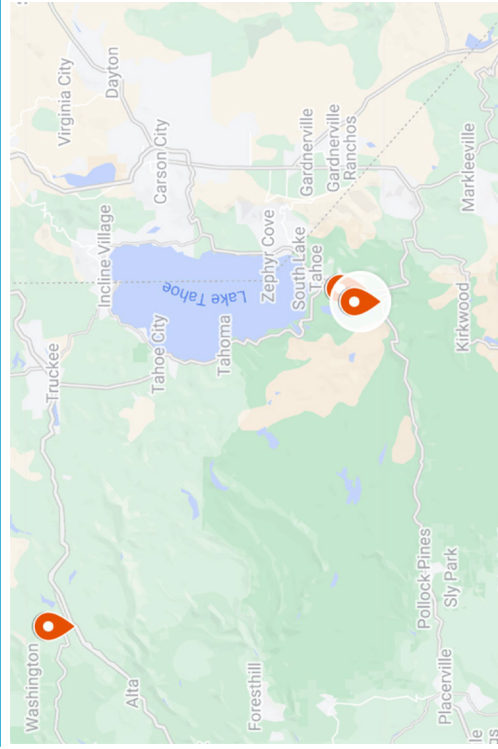
ELECTRIC UTILITY
PG&E

LOCAL ENGAGEMENT
El Dorado County Chamber of Commerce
El Dorado Hills Community Services District
Lake Tahoe South Shore Chamber of Commerce
Tahoe Regional Planning Agency (TRPA)

CALENVIROSCREEN MAP



LOCATION COMPARED TO PLANNED AND PROPOSED STATIONS



POTENTIAL BUSINESS MODELS

This location is a small hotel known as "Little Norway" and has been uninhabited for a decade. The building could be renovated to include a convenience store. The site has two driveways on Highway 50 and a third driveway on a truck accessible access road, Johnson Pass.

PUBLIC STATION:

Private development by a commercial fleet user or station developer using State of California or federal grants, IRS tax credits, and incentive programs for a public station. Potential users include companies and owner/operators that are:

- Long-haul trucking
- Private motorcoach operators
- Tahoe Transit District
- Sierra Ski Ranch

OVERNIGHT PARKING

This area could be a vital stop for drivers during the winter. Highway 50 is subject to long delays and road closures due to weather, rockslides, traffic accidents, and tourist travel. Currently, no place in the South Lake Tahoe area has authorized overnight parking.

LIGHT DUTY

Currently, Highway 50 has one charging station in Strawberry. Providing a fuel island and/or sharing charging stations with LDVs will create an additional benefit for Lake Tahoe visitors.

LOCAL PARTNERS

PERMITS: El Dorado County for building permits and business license. It is zoned as a "by-right" gas station. El Dorado AQMD for Authority to Construct.

FIRE: This location is in a fire zone and will need to have permits from Lake Valley FPD and comply with El Dorado County's driveway slope policy.

SEPTIC: The site will require an inspection and permit for the well and septic system from El Dorado County Environmental Services.

CEQA: The site may require CEQA and NEPA (if federally funded) to grade the property and meet the driveway slope requirements.

ROADWAY: Add a sign before Johnson Pass Road to warn of trucks entering and exiting.

HYDROGEN SETBACK: This site has no adjacent buildings and can accommodate the hydrogen setup requirements. Contact CAL FIRE and GO-Biz.

ELECTRICAL: This site will require electrical upgrades for DFC and may need a back-up generator. Contact PG&E.

LOCAL ENGAGEMENT

OUTREACH FORMATS:

- Leveraging existing public meetings such as those held by the El Dorado County Board of Supervisors, City of South Lake Tahoe City Council, Tahoe Transportation District, Tahoe Regional Planning Agency, and SSTMA.
- Organizing in-person events, emphasizing the value of face-to-face interactions.
- Target community groups in the unincorporated areas like Meyers for stakeholder engagement meetings.

EVENTS FOR DISCUSSION:

- Participating in an electric vehicle conference scheduled for August 22nd at the South Lake Tahoe event center.
- Engaging the community during local events such as Earth Day, bike & ski swaps, farmers markets, and city council meetings.

ORGANIZATIONS TO ENGAGE:

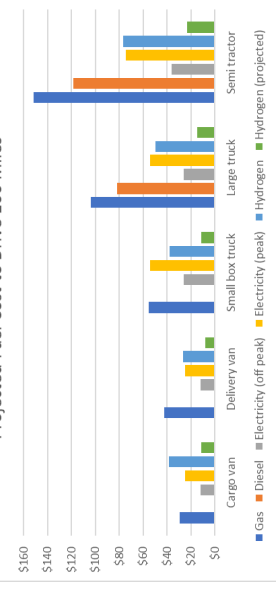
- Tahoe Transportation District, Tahoe Regional Planning Agency for insights on regional transportation and planning.
- Local leaders such as Bonnie Turnbull (LTUSD School Board member), John Friedrich (CLST Council member), and Sara Letton (CSLT Sustainability Coordinator) for their roles in education, local governance, and sustainability initiatives.

ECONOMIC IMPACTS

Filling with off-peak electricity or hydrogen will save money compared to filling with traditional fuels. It will be important to levelized the cost of electricity across utilities and times of day so that operators can have more certainty.

The transition to ZEV fuels will greatly reduce state and local tax revenue. Local governments need to start planning to understand the impact.

Projected Fuel Cost to Drive 100 Miles



Gas and diesel price includes state and federal excise tax, state and local sales tax, cost of fuel, overhead and profit. Electricity price includes cost of fuel. Hydrogen price includes state and local sales tax, cost of fuel.

Appendix D:

Data Sources

The primary sources of data used to compile this report include:

- Caltrans' *California Statewide Truck Parking Study* [10]⁴⁷
- Caltrans' *California Freight Mobility Plan 2023* [11]⁴⁸
- California's Protected Areas Database [12]⁴⁹
- Caltrans Truck AADT
- Disadvantaged Communities from CalEnviroScreen 4.0, Federal Justice 40 communities, and AB 617 communities
- Industrial employment from SACOG's SACSIM, SJCOG's VMIP2 Travel Demand Model, and MTC's Bay Area Metro Model One
- Findings from CEC-funded Medium- and Heavy-Duty Blueprints in Sacramento and West Sacramento (SMUD), Alameda County (Ava Community Energy), Central Coast (Central Coast Community Energy), Stockton Unified School District, and United Natural Foods, Inc.
- Locations of existing truck fuel stations and travel plazas/tuck stops
- Locations of public charging and hydrogen stations planned, funded, under construction, and in development
- State and federal hours-of-service regulations for truck drivers
- State and federal regulations for transporting livestock
- State and federal regulations for the safe transportation of raw and processed food

⁴⁷ <https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/freight-planning/plan-accordion/catrpkpgstdy-finalreport-a11y.pdf>

⁴⁸ <https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/cfmpjuly2023finala11y.pdf>

⁴⁹ <https://www.calands.org/>

- Opportunities to leverage construction projects on and near freight travel routes
- California's submission to the Federal government for funding the West Coast Electric Highway on I-5 between San Diego and Seattle
- Current and pending regulations, goals, and plans for electrification for marine, rail, and airports
- Interviews with station developers, funding agencies, utilities, and fleets
- Online databases with property information, including commercial real estate, county accessors, zoning maps, and opportunity zones
- Roadway constraints that include addition

Appendix E:

Fact Sheets for Community Engagement

The project team created community outreach fact sheets to address the challenges faced by local governments and encourage developers to undertake substantial community outreach efforts. Local governments may also lack the capacity or experience to implement these actions. Using extensive data collected from each potential charging site, each addresses topics of concern to the Megaregion, including permitting, community outreach, and driver safety. This approach intends to secure meaningful and effective engagement while ensuring consistency and effectiveness.

Northern California Megaregion **Zero Emission Medium- and Heavy-Duty Vehicle Study**

Fact Sheet:

AB 970 - Streamlining EV Charging Station Permits



Fact Sheet:

AB 970 — Streamlining EV Charging Station Permits

Assembly Bill No. 970 (AB 970) is a critical piece of legislation aimed at accelerating the deployment of electric vehicle (EV) charging stations across California by streamlining the permitting process. However, varying interpretations by state and local governments have led to discrepancies in its implementation. This fact sheet provides an overview of the issues and recommends actions for local governments to align with the state's objectives effectively.

Key Provisions:

- **Expedited Permitting Process:** Local authorities must provide administrative approval for EV charging stations through building permits or similar non-discretionary permits.
- **Defined Timelines:** Applications must be deemed complete within 5 to 10 business days depending on the number of charging stations proposed. If not approved within 20 to 40 business days after being deemed complete, the application is automatically approved unless specific adverse impacts are identified.
- **Reduction in Parking Requirements:** Local authorities are permitted to reduce the number of required parking spaces to accommodate EV charging stations.

Issues and Interpretations:

- **Nonconforming Use and Zoning Changes:** Local governments are facing challenges when areas previously zoned for industrial use are rezoned for residential or mixed use. Under these new zoning regulations, installing charging stations is often seen as a non-conforming use, leading to permit denials or requirements for additional approvals.
- **Varying Local Interpretations:** Some local jurisdictions interpret AB 970 as requiring them to grant any permit for a charging station, while others view it more restrictively, particularly in areas that have been rezoned. This inconsistency hampers the uniform application of the law.

Understanding AB 970

AB 970 mandates that cities, counties, and city and county governments administratively approve applications to install electric vehicle charging stations through streamlined processes. This legislation is designed to remove bureaucratic barriers and promote the rapid expansion of EV infrastructure, which is essential for meeting California's ambitious environmental goals.



Northern California Megaregion **Zero Emission Medium- and Heavy-Duty Vehicle Study**

Fact Sheet:
Guiding Developers Toward
Effective Community
Engagement
for ZEV Station
Projects



Fact Sheet:

Guiding Developers Toward Effective Community Engagement for ZEV Station Projects

As local governments facilitate the development of zero-emission vehicle (ZEV) charging stations, it is vital to ensure that developers engage effectively with the community. This fact sheet provides strategic recommendations for local governments to encourage developers to adopt robust community engagement practices, enhancing transparency, improving project outcomes, and ensuring community needs and concerns are addressed. Funding organizations, including utilities and state agencies, should require community engagement with funding applications and progress reports to ensure that truck traffic does not have unintended consequences.



Strategic Recommendations for Local Governments

Establish Clear Community Engagement Expectations:

- **Encourage Meaningful Engagement Plans:** Local governments should encourage developers to submit comprehensive community engagement plans as part of the project approval process. These plans should detail strategies for informing, consulting, and involving the community throughout the project lifecycle.

- **Set Standards:** Define clear standards and expectations for community engagement, including minimum requirements for stakeholder consultation, public meetings, and feedback mechanisms.

Provide Guidelines and Resources:

- **Develop Guidelines:** Create and distribute guidelines that outline best practices in community engagement, tailored to the unique aspects of ZEV charging station projects. These guidelines can help developers understand the scope and depth of engagement expected.
- **Offer Templates and Tools:** Provide developers with sample templates for communication materials, feedback forms, and presentation formats to facilitate standardized and effective outreach efforts.

Facilitate Training and Workshops:

- **Conduct Training Sessions:** Organize training sessions for developers on effective community engagement strategies, focusing on cultural sensitivity, transparent communication, and conflict resolution.
- **Collaborate with Experts:** Partner with community engagement experts or consultants who can provide specialized training and support to developers.

Encourage Community-Centric Design:

- **Promote Inclusive Design Workshops:** Encourage developers to conduct design workshops with community members, allowing direct input into the project design and fostering a sense of ownership and acceptance among local residents.
- **Highlight Success Stories:** Share examples of successful community-engaged projects to demonstrate the positive impact of active and inclusive community involvement.

Implement Monitoring and Incentives:

- **Monitor Compliance:** Regularly review the implementation of community engagement plans by developers to ensure compliance with local government recommendations.
- **Provide Incentives:** Offer incentives such as expedited permitting or public recognition for projects that exceed standard community engagement requirements.

Establish Feedback and Reporting Mechanisms:

- **Require Regular Updates:** Require that developers provide regular updates to both the local government and the community on engagement activities and project progress as part of the approval process.
- **Set Up Feedback Channels:** Ensure that developers establish channels through which community members can provide ongoing feedback. This could involve digital platforms, community liaison officers, or regular public meetings.



Conclusion

For local governments, ensuring that developers engage with communities effectively is crucial to the success of ZEV charging station projects. By setting clear expectations, providing necessary resources, and encouraging compliance, local governments can persuade developers to conduct thorough and meaningful community engagement. This approach not only enhances project transparency and community trust but also ensures that the final outcomes align closely with community needs and expectations, leading to more sustainable and accepted developments.



Northern California Megaregion **Zero Emission Medium- and Heavy-Duty Vehicle Study**

Fact Sheet:
Enhancing Personal Safety
for Women Truck Drivers
at Truck Stops



Fact Sheet:

Enhancing Personal Safety for Women Truck Drivers at Truck Stops

The trucking industry, traditionally male-dominated, is evolving to become more inclusive and diverse. However, women truck drivers often face unique safety challenges and concerns that need to be addressed to ensure their well-being on the road. This fact sheet provides local government officials with practical strategies and recommendations for enhancing personal safety at truck stops and travel plazas for women drivers, thereby promoting a safer and more inclusive environment. These strategies also apply to rest areas and overnight truck parking.



Key Issues and Recommended Actions

Enhanced Security Measures:

- **Lighting:** Local governments should ensure that all truck stops within their jurisdiction have adequate lighting, especially in parking lots and walkways. This enhances visibility and safety, making the spaces less inviting for potential threats.
- **Surveillance:** Installation of comprehensive surveillance systems at truck stops is crucial. Continuous monitoring

can deter potential threats and provide evidence if safety incidents occur.

- **Emergency Stations:** Equip truck stops with clearly marked emergency call buttons. These should be strategically placed and easily accessible to provide quick responses in emergencies.
- **Resource:** For more insights on implementing these security features, local officials can refer to best practices highlighted in the [Truck Stops Guide](#) on [CloudTrucks.com](#).

Gender-Sensitive and Culturally Inclusive Facilities

- **Separate Showers:** Mandate that facilities with showers have separate areas for people who identify as women and those that identify as men. Use a queuing system that doesn't require people to wait in line or to call people by name over an intercom or loud speaker. Consideration should also be given to family restrooms to accommodate diverse needs.
- **Cultural Sensitivity:** Design truck stops to respect diverse cultural backgrounds. This includes installing multilingual signs and incorporating culturally appropriate decor. Involvement of local indigenous communities in the design process can enrich the cultural sensitivity of the spaces.
- **Resource:** The [Handbook for Gender-Inclusive Urban Planning and Design](#) provides comprehensive guidelines that can be adapted for the design of truck stops and travel plazas.



Trucking Assessing and Addressing the Lack of Truck Parking, discusses the development of community and support services at truck stops and travel plazas.

Community and Support Services

- **Community Rooms:** Local governments should encourage the establishment of community rooms at truck stops. These spaces should be designed to allow drivers, especially women and minorities, to connect, share experiences, and offer support, fostering a sense of community and mutual assistance.
- **Information and Support Services:** Provide resources on handling discrimination and harassment and facilitate access to support networks specifically for women drivers.
- **Resource:** The white paper from *Women in*

Training and Education

- **Staff Training:** Local governments should mandate regular training for truck stop staff on cultural sensitivity, gender issues, and emergency response. This training will ensure that staff are well-equipped to support a diverse range of drivers.
- **Driver Education:** Offer educational materials and workshops on personal safety and legal rights, with a particular focus on supporting women and minority drivers.
- **Resource:** For detailed training plans, local governments can refer to the sample cultural sensitivity training plan at synergita.com, and for legal rights education, the [Civil Rights Division of the U.S. Department of Justice](https://www.dhs.gov/civil-rights) provides authoritative information.

Feedback and Adaptation

- **Feedback Mechanisms:** Local governments should encourage the establishment of robust feedback systems at truck stops and travel plazas. These systems are crucial for gathering direct input from drivers about their safety experiences and the effectiveness of existing measures. Feedback mechanisms can include digital surveys, suggestion boxes, and regular safety meetings.
- **Resource:** Companies like [Workhound](https://workhound.com) provide customized products to create comprehensive trucking feedback programs.

Conclusion

By implementing these strategies, local governments can significantly enhance the safety and inclusivity of truck stops and travel plazas, particularly for women drivers. Caltrans can also adapt these strategies at rest areas and authorized truck parking locations. The actions will improve working conditions for these drivers and empower them to perform their roles with confidence and dignity, contributing to a safer and more equitable trucking industry.

