



California  
**ENERGY COMMISSION**



California Energy Commission  
Clean Transportation Program

## **FINAL PROJECT REPORT**

# **San Francisco's Medium- and Heavy- Duty Zero- Emission Vehicles Blueprint Report**

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**Prepared by: San Francisco Environment Department**

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# California Energy Commission

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This Medium- and Heavy-Duty Zero-Emission Vehicles Blueprint was authored by the City and County of San Francisco Environment Department (SF Environment) with support from a Technical Advisory Committee that included staff from several City agencies and other partners, as well as the input and knowledge of many individuals from other City agencies and organizations, all of whom are listed below. Technical Advisory Committee members are listed in APPENDIX B: Table 6: Technical Advisory Committee Members. The views and opinions expressed in this document are not necessarily representative of the views of individual participants and/or the organizations they represent.

- SF Office of the City Administrator – Central Shops
- SF Municipal Transportation Agency
- SF Recreation & Parks Department
- SF Department of Public Works
- The Port of San Francisco
- SF Planning Department
- SF County Transportation Authority
- SF Office of Economic and Workforce Development
- City College of San Francisco
- SF Public Utilities Commission
- Pacific Gas & Electric
- Meals on Wheels
- The SF Produce Market
- Leaders4E.A.R.T.H.<sup>1</sup> – Mission Neighborhood Center
- Golden Gate Truck Center
- CALSTART
- Sacramento Clean Cities Coalition
- EVgo
- InCharge Energy
- WattEV
- Rocky Mountain Institute
- Recology

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<sup>1</sup> Leaders for Environmental Activism Reclaiming Their Health.

# PREFACE

Assembly Bill 118 (Núñez, Chapter 750, Statutes of 2007) created the Clean Transportation Program. The statute authorizes the California Energy Commission (CEC) to develop and deploy alternative and renewable fuels and advanced transportation technologies to help attain the state's climate change policies. Assembly Bill 8 (Perea, Chapter 401, Statutes of 2013) reauthorizes the Clean Transportation Program through January 1, 2024, and specifies that the CEC allocate up to \$20 million per year (or up to 20 percent of each fiscal year's funds) in funding for hydrogen station development until at least 100 stations are operational.

The Clean Transportation Program has an annual budget of about \$100 million and provides financial support for projects that:

- Reduce California's use and dependence on petroleum transportation fuels and increase the use of alternative and renewable fuels and advanced vehicle technologies.
- Produce sustainable alternative and renewable low-carbon fuels in California.
- Expand alternative fueling infrastructure and fueling stations.
- Improve the efficiency, performance and market viability of alternative light-, medium-, and heavy-duty vehicle technologies.
- Expand the alternative fueling infrastructure available to existing fleets, public transit, and transportation corridors.
- Establish workforce-training programs and conduct public outreach on the benefits of alternative transportation fuels and vehicle technologies.

To be eligible for funding under GFO-20-601, projects must also be consistent with the CEC's annual Clean Transportation Program Investment Plan Update. The CEC issued GFO-20-601 entitled "Blueprints for Medium- and Heavy-Duty Zero-Emission Vehicle Infrastructure" to develop planning "blueprints" that will identify the actions and milestones needed for implementation of medium- and heavy-duty (MDHD) zero-emission vehicles (ZEVs) and the related and necessary electric vehicle charging and/or hydrogen refueling infrastructure. The intent of these planning documents is to accelerate the deployment of MDHD ZEVs and ZEV infrastructure with a holistic and futuristic view of transportation planning and ensure fleets are in a good position to implement ZEVs into their business. In response to GFO-20-601, the recipient submitted an application which was proposed for funding in the CEC's Notice of Proposed Awards on April 8, 2021 and the agreement was executed as ARV-21-013 on July 15, 2021.

# ABSTRACT

The San Francisco Medium- and Heavy-Duty Zero-Emission Vehicle (MDHD ZEV) Blueprint aims to transition 10,000 MDHD vehicles to zero-emission by 2030, aligning with the City's ambitious Climate Action Plan<sup>2</sup> goal of net-zero emissions in San Francisco by 2040, and the California Air Resources Board's (CARB's) statewide goal of 100% zero-emission MDHD on-road vehicles by 2045 where feasible. The Blueprint lays out a pathway to reduce emissions from the transportation sector, targeting MDHD, which are significant contributors to urban pollution. This report details the process of creating the MDHD ZEV Blueprint, with sections on the project's purpose, the team's approach, activities performed, and proposed policy solutions.

**Keywords:** Zero-emission vehicle, medium-duty vehicle, heavy-duty vehicle, electric vehicle, EV charging

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<sup>2</sup> City and County of San Francisco Environment Department. (2021). *San Francisco's Climate Action Plan*. Retrieved from San Francisco Environment: [https://www.sfenvironment.org/files/events/2021\\_climate\\_action\\_plan.pdf](https://www.sfenvironment.org/files/events/2021_climate_action_plan.pdf).



# TABLE OF CONTENTS

	Page
Acknowledgments .....	i
Preface.....	ii
Abstract .....	iii
Table of Contents.....	v
List of Figures.....	vi
List of Tables .....	vi
Executive Summary.....	1
Project Background .....	1
Key Objectives .....	1
Assessment of Success .....	2
CHAPTER 1: Introduction .....	5
Goals of the Grant Project.....	5
CHAPTER 2: Data Inventory and Analysis .....	7
Results .....	9
Learnings.....	10
CHAPTER 3: Outreach and Stakeholder Engagement.....	12
Technical Advisory Committee.....	12
Small Fleets Needs Assessment.....	13
Disadvantaged Communities Needs Assessment.....	14
Outreach to the Municipal Fleet.....	16
Recreation & Parks Department.....	16
San Francisco Municipal Transportation Agency .....	17
San Francisco Department of Public Works .....	17
Learnings.....	18
CHAPTER 4: MDHD Charging Suitability Map .....	20
Data Collection.....	20
Prioritizing Data Layers.....	21
Output: Charging Suitability Map.....	22
Learnings.....	23
CHAPTER 5: Innovations and Policy Recommendations .....	24
Innovations Report.....	24
Pilot Implementation Plan .....	25
Learnings.....	28
CHAPTER 6: Assessment of Success.....	29
Challenges and Opportunities.....	30
Conclusion and Next Steps.....	30

Data Inventory and Analysis.....	31
Outreach and Stakeholder Engagement .....	31
MDHD Charging Suitability Map .....	31
Innovations and Policy Recommendations.....	32
Glossary .....	33
APPENDIX A: Data Collection and Analysis.....	1
APPENDIX B: Blueprint Engagement Plan .....	2
APPENDIX C: MDHD Charging Suitability Map .....	3
APPENDIX D: Fact Sheet .....	1
APPENDIX E: Blueprint.....	1

## **LIST OF FIGURES**

	Page
Figure 1: Top Five Uses for MDHD Vehicles Registered in San Francisco.....	10
Figure 2: Bayview-Hunters Point Survey Area .....	14
Figure 3: Bayview-Hunters Point Survey Excerpt 1 .....	15
Figure 4: Bayview-Hunters Point Survey Excerpt 2 .....	15
Figure 5: Workshop at Golden Gate Park Structural Maintenance Yard .....	16
Figure 6: DPW Cesar Chavez Yard.....	18
Figure 7: Analytic Hierarchy Process Diagram .....	21
Figure 8: MDHD Charging Suitability Mapping Tool Sample.....	23
Figure 9: Central parking area at The SF Market .....	27
Figure 10: Tenant's loading dock at The SF Market.....	28

## **LIST OF TABLES**

	Page
Table 1: Data Collection Table .....	7
Table 2: Arup Analysis of City MDHD Vehicle Data .....	11
Table 3: MDHD Charging Suitability Mapping Tool Layer Prioritization .....	22
Table 4: Innovation Areas .....	25
Table 5: Site Selection Criteria Framework.....	26
Table 6: Technical Advisory Committee Members.....	A-2



# EXECUTIVE SUMMARY

The San Francisco Medium- and Heavy-Duty Zero-Emission Vehicles (MDHD ZEV) Blueprint aims to transition 10,000 MDHD vehicles to zero-emission by 2030, aligning with the City's ambitious Climate Action Plan goal of net-zero emissions in San Francisco by 2040 and CARB's statewide goal of 100% zero-emission MDHD on-road vehicles by 2045 where feasible. The Blueprint lays out a pathway to reduce emissions from the transportation sector, targeting MDHD vehicles, which are significant contributors to urban pollution. This report describes the process of creating the MDHD ZEV Blueprint, with sections detailing the completion of each task outlined in the grant Scope of Work including the purpose, the approach, the activities performed, and the challenges and potential solutions identified through the process. Products associated with each task are noted in the appendices, and are accompanying this Report as attachments.

## Project Background

In 2022, the transportation sector was responsible for 45% of emissions in San Francisco, heavily impacting disadvantaged communities (DAC) near major traffic corridors. With nearly 40,000 MDHD vehicles operating daily in the city, San Francisco ranks among the most polluted areas in the country concerning diesel particulate matter 2.5 (PM2.5).<sup>3</sup> To combat this, SF Environment, with support from the California Energy Commission, developed the MDHD ZEV Blueprint to strategize the transition of public and private fleets to ZEVs.

To address the issue of transportation-related climate emissions, departments and partners from across the City and County of San Francisco (the City) and the private sector developed the EV Roadmap.<sup>4</sup> One of the recommendations from the report specifically focuses on accelerating MDHD ZEV adoption, with an interim goal of 10,000 MDHD ZEVs operating in the City by 2030. Additionally, successful MDHD ZEV adoption is a requirement to achieve the City's Climate Action Plan goal of net-zero emissions in San Francisco by 2040 and CARB's statewide goal of 100% zero-emission MDHD on-road vehicles by 2045 where feasible.<sup>5</sup> At the time of this reporting, the City does not have sufficient charging infrastructure planned to support the 2030 charging needs of 10,000 MDHD ZEV from interregional trucks and buses traveling to and through the city, the municipal fleet, and local small- and medium-sized fleets (with fewer than 50 vehicles).

## Key Objectives

The objectives of the San Francisco MDHD ZEV Blueprint Report are to assess the project team's success in achieving the original goals laid out in the project's Scope of Work and in providing energy-related benefits to California residents through the development and future implementation of the MDHD Blueprint.

The Final Report will:

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<sup>3</sup> The American Lung Association. (2024). *State of the Air*. Retrieved from <https://www.lung.org/getmedia/dabac59e-963b-4e9b-bf0f-73615b07bfd8/State-of-the-Air-2024.pdf>.

<sup>4</sup> SFE. (2019). *San Francisco's Electric Vehicle Ready Community Blueprint*. Retrieved from San Francisco Environment: [https://www.sfenvironment.org/files/editor-uploads/transportation\\_vehicle/san\\_francisco\\_ev\\_blueprint.pdf](https://www.sfenvironment.org/files/editor-uploads/transportation_vehicle/san_francisco_ev_blueprint.pdf).

<sup>5</sup> CARB. (2021). *Zero-Emission On-Road Medium- and Heavy-Duty Strategies*. Retrieved from [https://ww2.arb.ca.gov/sites/default/files/2021-04/20-016%20Factsheet\\_ZE%20onroad%20strategies.pdf](https://ww2.arb.ca.gov/sites/default/files/2021-04/20-016%20Factsheet_ZE%20onroad%20strategies.pdf).

- Clearly and completely describe the project’s purpose, approach, activities performed and results,
- Present a public assessment of the success of the project as measured by the degree to which goals and objectives were achieved,
- Make insightful observations based on results obtained,
- Draw conclusions and make recommendations for further projects and improvements,
- Include all Task-related products created throughout the grant performance period.

This Final Report examines the process of developing the Blueprint’s problem statement, assessing the problem through data collection and community outreach, and developing collaborative solutions contained in the Blueprint based on information gathered from participants.

## **Assessment of Success**

Entering into the Blueprint process, SF Environment had a broad understanding of the issues that different populations face in adopting MDHD ZEVs. The three primary challenge areas identified through the Blueprint development process, and which provide the basis for all strategies and actions outlined in the Blueprint, are:

1. **Support for Small- and Medium-Sized Fleets.** Small- and medium-sized fleet transition is currently voluntary, and fleets lack time and resources to support ZEV adoption.
2. **Strengthening the ZEV Ecosystem with a Focus on Charging.** San Francisco currently lacks charging infrastructure to accommodate 2030 MDHD ZEV goals.
3. **Public Sector ZEV Adoption.** Decentralized vehicle procurement and adoption processes, as well as significant funding needs, inhibit San Francisco’s municipal fleet transition.

To develop the solutions and interventions that address these issues, SF Environment divided the Blueprint development process into distinct tasks with defined deliverables that are outlined in the Scope of Work. The tasks included:

1. Data Inventory and Analysis
2. Outreach and Stakeholder Engagement
3. Charging Suitability Map Creation
4. Innovations and Policy Recommendations

Engaging in each of these tasks helped the project team to identify unique challenges that the municipal fleet, small- and medium-sized fleets, and the city overall must overcome to reach the City’s 2030 and 2045 goals. The process helped to highlight—and even launch the City into advancing—opportunities to address the issues, while also helping to surface additional challenges that moderately impacted the success of the development of the Blueprint, but more importantly, informed the City on key issues to watch. Some of the key challenges and related opportunities include:

- 1. Securing commitments from partners to participate in solutions prior to completing technical planning and identifying accessible funding sources**—SF Environment worked closely with the Port of San Francisco and The SF Market to understand needs and next steps for shared charging pilots. Both entities expressed interest in implementing a specific pilot project. However, as their individual ZEV planning efforts advanced during the development of the Blueprint, uncertainties regarding pilot implementation timelines, preferred structures for their diverse fleet operators, and likely governance models limited the level of commitment to specific project concepts that these entities could make in the final Blueprint. As a result, SF Environment will maintain its relationships with the Port of San Francisco and The SF Market to obtain ongoing updates on their ZEV planning efforts as they adapt the proposed pilot projects to suit their evolving needs, while also identifying funding sources that would enable progress on implementation of these adapted pilots. SF Environment is committed to taking the lead with these partners to apply to funding opportunities.
- 2. Small- and medium-sized fleets are hard to reach**—SF Environment began small fleet engagement during execution of the outreach task but was only able to gather survey data from 13 fleets despite three rounds of outreach. The barriers to connecting with these fleets included no primary fleet contacts, limited fleet employee time to respond to requests, out-of-date contact information, and limited resources to engage in on-the-ground outreach. Taking lessons learned from the survey process and discussions with Technical Advisory Committee (TAC) members, the Blueprint includes an action under Strategy A to launch a Fleet Engagement and Technical Assistance program with targeted outreach to hard-to-reach fleets. SF Environment has committed funding to launch this effort.
- 3. The confluence of barriers to municipal fleet transition**—SF Environment and the San Francisco City Administrator’s Office—Central Shops (Central Shops) identified a confluence of barriers to City fleet transition. These include: the City’s unique decentralized fleet management system, a lack of dedicated funding, a lack of ZEV models suitable for City fleet demands, concerns about ZEV reliability during emergencies, a lack of electrical capacity to install onsite charging for MDHD ZEVs, and a need for general education around ZEV operations and maintenance. During the execution of the outreach task, SF Environment launched fleet vehicle composition and domicile location data compilation to help the City move in a more centralized direction, and SF Environment continues its work with Central Shops to identify funding opportunities and participate in proposal development.

Overall, the process of developing the MDHD Blueprint was successful, as it not only resulted in a comprehensive and actionable Blueprint, but it also deepened SF Environment’s relationship with partners while facilitating new relationships with critical entities. Many of these entities co-developed, and are prepared to engage with SF Environment to implement the actions laid out in the Blueprint, and now look to SF Environment as an MDHD subject

matter expert. They are willing to follow SF Environment's leadership in identifying, sharing, and participating in proposal development for funding to implement the Blueprint and associated projects. With this Blueprint development work done, and the MDHD Blueprint providing the pathway, San Francisco has already moved closer to the City's 2030 goals.

# CHAPTER 1: Introduction

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In 2022, the transportation sector was responsible for 45% of the emissions in the city,<sup>6</sup> especially impacting state-designated DACs near major traffic corridors and freeways. As both a gateway and destination city for the region's goods movement, nearly 40,000 MDHD vehicles operate in San Francisco every workday.<sup>7</sup> Moreover, as of May 2023, there are nearly 18,000 MDHD vehicles registered in the City.<sup>8</sup> The sheer volume of MDHD traffic makes San Francisco one of the most polluted areas in the country when it comes to PM<sub>2.5</sub>.<sup>9</sup>

To address the issue of transportation-related climate emissions, departments from across the City and the private sector developed the EV Roadmap.<sup>10</sup> This effort, led by SF Environment, resulted in six program areas, each with its own suite of actions to advance strategic electrification efforts across the transportation sector.

One of the recommendations from the report specifically focuses on accelerating MDHD ZEV adoption, with an interim goal of 10,000 MDHD ZEVs operating in the City by 2030. Additionally, successful MDHD ZEV adoption is a specific focus of the City's Climate Action Plan (net-zero emissions in San Francisco by 2040) and CARB's statewide goal (100% zero-emission MDHD on-road vehicles by 2045 where feasible).<sup>11</sup> At the time of this reporting, the City does not have sufficient charging infrastructure planned to support the 2030 charging needs of 10,000 MDHD ZEV from interregional trucks and buses traveling to and through the City, the municipal fleet, and local small- and medium-sized fleets. Of the 1,112 publicly accessible charging ports available in San Francisco County in December 2024, none have a designated Maximum Vehicle Class for MDHD vehicles listed on the Department of Energy's Alternative Fuels Data Center.

The Blueprint developed through this grant details actions, tasks, and timeframes; identifies potential barriers and challenges; identifies pilot projects to support the transition of both its public and private fleets; and designates roles for City departments and partners to support completion of tasks and achieve the primary outcome for each strategy. This Final Report assesses the project team's success in achieving the original goals laid out in the project's Scope of Work and in creating a final Blueprint that will provide significant energy-related benefits to California residents.

## Goals of the Grant Project

San Francisco developed a Blueprint to accelerate and advance MDHD ZEV adoption of all fleets, large and small. The goals of the agreement were:

1. Collect data to take inventory and analyze the interregional and local MDHD fleets;

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<sup>6</sup> City and County of San Francisco Environment Department. (2024). *2022 San Francisco Sector-based Greenhouse Gas Emissions Inventory At-A-Glance*. Retrieved from <https://www.sfenvironment.org/media/14349>.

<sup>7</sup> Caltrans Traffic Census Program. (2025). *Truck Traffic: Annual Average Daily Truck Traffic 2022*. Retrieved from <https://dot.ca.gov/programs/traffic-operations/census>.

<sup>8</sup> State of California Department of Motor Vehicles. (2025). *Vehicles Registered by County 2023*. Retrieved from <https://www.dmv.ca.gov/portal/dmv-research-reports/research-development-data-dashboards/vehicles-registered-by-county/>.

<sup>9</sup> The American Lung Association. *State of the Air*.

<sup>10</sup> SFE. *San Francisco's Electric Vehicle Ready Community Blueprint*.

<sup>11</sup> CARB. *Zero-Emission On-Road Medium- and Heavy-Duty Strategies*.

2. Engage diverse stakeholders to be a part of the process to develop the Blueprint and the MDHD Charging Suitability Map;
3. Develop the MDHD Charging Suitability Map identifying optimal MDHD charging sites;
4. Investigate innovative approaches, actions and pilot projects that spur infrastructure investment and make the chargers on the MDHD Charging Suitability Map a reality; and
5. Deliver an executable Blueprint with milestones, that provides the 2030 charging needs of interregional trucks and buses traveling to and through the City, the municipal MDHD fleet, and local small- and medium-sized MDHD fleets, ensuring none are left behind.

The project achieved these goals, and this Final Report details the primary tasks outlined in the Scope of Work that helped the City successfully complete the project, including: Inventory and Analysis, Outreach and Stakeholder Engagement, Creation of the MDHD Charging Suitability Map, and Innovations to Spur Charging Investment. The following sections of this Final Report provide an account of the process of accomplishing each task, key results, and an overall assessment of the project's success. Appendices note the deliverables associated with each task, and all task-related deliverables are accompanying this Report.

# CHAPTER 2: Data Inventory and Analysis

Through the Data Inventory and Analysis task the project team collected and analyzed data to determine the Energy Demand (MWh), number of depot chargers, and number of ultra-fast/high-powered chargers needed to reach 2030 goals. The information was used to support decision-making and establish a MDHD baseline and segmentation.

To accomplish this, SF Environment worked with Arup, a planning and design firm, to develop the Data Collection Plan, which was a deliverable in the grant agreement’s Scope of Work, Task 2. The Data Collection Plan determined the three main data categories required: domicile location, travel information, and grid capacity. With those categories in mind, SF Environment and Arup developed a data collection table (Table 1 below) including data source, data to be collected, goals to be addressed, collection method, and collection leads. All data that was collected was publicly available data.

**Table 1: Data Collection Table**

<b>Data Source</b>	<b>Data to be Collected</b>	<b>Goal(s) to be Addressed</b>	<b>Collection Method</b>	<b>Collection Lead</b>
<b>Alternative Fuel Data Center (AFDC)</b>	Planned and existing charger locations, charger type	Identify areas where charging exists and where charging deserts/gaps are. This informs potential charging siting locations.	Online download	SFE
<b>California Department of Motor Vehicles (DMV)</b>	Vehicles registered in San Francisco, specifying make and model, model year, ZIP code, fuel, and vehicle types	Identify electric vehicle domicile locations and where multiple MDHD vehicles may be domiciled. This gives us an indication for where most charging is going to occur.	Submit data request to data source	SFE
<b>Caltrans</b>	Truck annual average daily traffic (AADT), number of MDHD vehicle crossings for major highways, truck size, truck type	Understand characteristics of inbound/outbound traffic. Inform on-route charging needs.	Submit data request to data source	Arup
<b>Central Shops</b>	City’s MDHD fleet vehicle composition, vehicle inventory information, vehicle miles traveled (VMT), vehicle type, vehicle age	Link municipal fleet vehicle inventory to domicile locations and identify vehicle replacement schedules.	Submit data request to data source	SFE

<b>Data Source</b>	<b>Data to be Collected</b>	<b>Goal(s) to be Addressed</b>	<b>Collection Method</b>	<b>Collection Lead</b>
<b>Clean Vehicle Rebate Project (CVRP)</b>	Electric vehicle registrations, make and model, census tract	Identify MDHD electric vehicles registered in San Francisco.	Online download	Arup
<b>Experian DMV Data via US DOE Clean Cities Program</b>	Vehicles registered in San Francisco, specifying make and model, model year, ZIP code, fuel, and vehicle types	Identify vehicle domicile and where multiple MDHD vehicles may be domiciled. This gives us an indication for where most charging is going to occur.	Submit data request to data source	SFE
<b>Federal Highway Administration - Freight Analysis Framework</b>	Provides estimates for tonnage and value by regions of origin and destination, commodity type, and mode for base year 2017 and a 30- year forecast.	Establish interregional traffic patterns for MDHD vehicles.	Online download	SFE
<b>Integration Capacity Analysis (ICA) map</b>	PG&E's distribution system and capacity	Identify areas of the San Francisco electrical grid with limited, excess, or lack of capacity.	Online	Arup
<b>Metropolitan Transportation Commission (MTC)</b>	Traffic and goods movement data in San Francisco Bay Area, interregional traffic information, vehicle types	Establish interregional traffic patterns for MDHD vehicles.	Submit data request to data source	SFE
<b>San Francisco Public Utilities Commission (SFPUC)</b>	Municipal grid capacity and planned distribution areas	Identify areas of the San Francisco electrical grid with limited, excess, or lack of capacity.	Submit data request to data source	SFE
<b>Central Shops</b>	Municipal fleet MDHD vehicle travel telematics information	Identify municipal fleet vehicle domicile locations, where multiple MDHD vehicles may be domiciled, and link to vehicle inventory. Identify opportunities for pooled charging based on usage.	Submit data request to data source	SFE

<b>Data Source</b>	<b>Data to be Collected</b>	<b>Goal(s) to be Addressed</b>	<b>Collection Method</b>	<b>Collection Lead</b>
<b>SF Treasurer's Office</b>	Business licenses	Cross-reference with the DMV data to identify the number, composition, and domicile locations of MDHD fleets in San Francisco.	Submit data request to data source	SFE
<b>UC Davis Institute for Transportation Studies</b>	State modeling for MDHD vehicles	Establish inter-regional traffic patterns for MDHD vehicles.	Submit data request to data source	SFE
<b>Replica</b>	Trip count and heat map	Identify trip destination summary for commercial freight vehicles within city limits	Submit data request to data source	SFE

Source: SF Environment and Arup

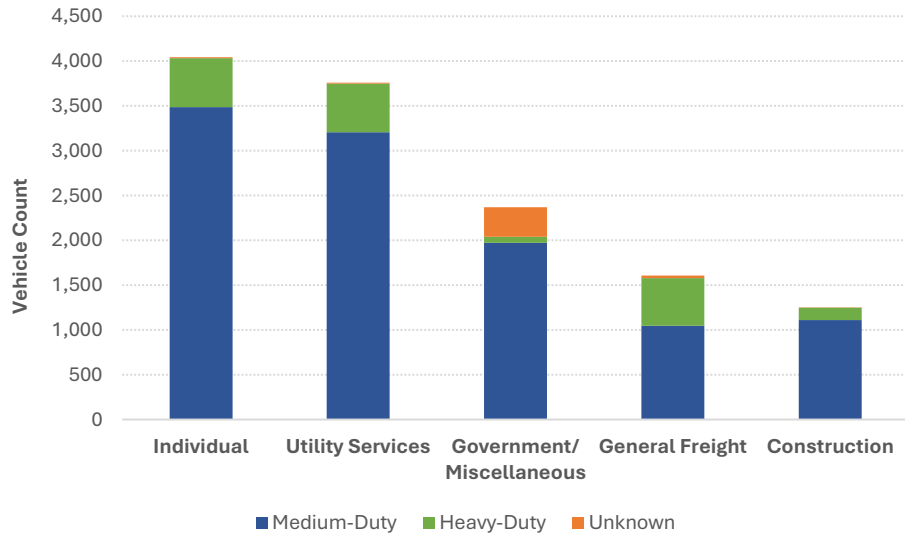
## Results

Arup's initial analysis of the data determined that the publicly available data, though extensive, still does not provide a holistic view of the MDHD vehicles domiciled in San Francisco (Table 2 below). While the municipal fleet is captured in the data, the data contained little insight into private fleets. The most comprehensive datasets were the Central Shops data, which included information about the City's approximately 3,500 MDHD municipal vehicles, and the DMV data<sup>12</sup>, which included information on both municipal and private vehicles but was outdated (2018-2019) when the data collection and analysis was completed. At that time, the DMV data did not include information on key metrics such as daily mileage. The initial DMV dataset provided information on over 13,000 MDHD vehicles that are registered in San Francisco, about 700 of which appeared to be registered to Central Shops addresses. The discrepancy in the quantity of MDHD between the DMV data and Central Shops data is likely attributed to incomplete data from the DMV on the types of MDHD vehicles operated by Central Shops, which include off-road equipment and street sweepers. Since the analysis, SF Environment acquired updated data from the DMV. As of June 2023, there are 17,914 MDHD vehicles registered in San Francisco. Well over half of these vehicles are medium-duty, with government representing the third-top use for these vehicles (Figure 1 below). As of December 2023, only 370 of the city's registered MDHD vehicles are ZEV, almost all of which are electric transit buses.<sup>13</sup> The final Blueprint contains June 2023 data from DMV.

<sup>12</sup> CA DMV. *Vehicles Registered by County 2023*.

<sup>13</sup> California Energy Commission. (2023). *Medium- and Heavy-Duty Zero Emission Vehicles in California*. Retrieved from <https://www.energy.ca.gov/data-reports/energy-almanac/zero-emission-vehicle-and-infrastructure-statistics-collection/medium>.

**Figure 1: Top Five Uses for MDHD Vehicles Registered in San Francisco**



Source: SF Environment analysis of California Department of Motor Vehicles, Vehicle Registrations. Data as of June 2023

Because of the lack of reliable data from the private sector, Arup opted to only evaluate the energy demand for the municipal fleet. Using data from Central Shops, Arup attempted to calculate the energy demand based on the number of MDHD vehicles (Table 2 below), their average daily mileage and likely charging habits (which informs their required charging rate), and the vehicle’s assumed energy consumption.

## Learnings

The initial analysis on City vehicles indicates that about 15 MWh/day of demand is required to charge the municipal fleet of MDHD ZEVs. Without specific data about daily private fleet mileage, the project team was unable to calculate private fleet energy demand and associated depot and public charging requirements. The project team identified key barriers to collecting private fleet data, primarily confidentiality and proprietary information, which inhibits private fleet data sharing, as well as difficulty in reaching private fleet managers, particularly small- and medium-sized fleets. The project team’s key takeaway from these learnings is the need to connect and build relationships with private fleets, particularly small- and medium-sized fleets, and create a trusted network through which fleets can securely share information on data, needs, and best practices. These relationships could be developed as part of the Blueprint’s proposed Fleet Engagement and Technical Assistance program.

**Table 2: Arup Analysis of City MDHD Vehicle Data**

<b>Department</b>	<b>Heavy Equipment<sup>14</sup></b>	<b>Trucks</b>	<b>Non-Revenue Buses</b>	<b>Small Offroad<sup>15</sup></b>	<b>Grand Total</b>
San Francisco International Airport	18	47	35	2	<b>102</b>
Department of Public Works	33	162	-	1	<b>196</b>
Department of Public Health	-	1	1	2	<b>4</b>
San Francisco Fire Department	-	146	-	-	<b>146</b>
San Francisco Municipal Transportation Agency <sup>16</sup>	9	54	-		<b>63</b>
San Francisco Port	5	16	-	3	<b>24</b>
San Francisco Public Utilities Commission	73	118	-	8	<b>199</b>
San Francisco Sheriff's Office	7	-	5	-	<b>12</b>
San Francisco General Services Administration	-	1		-	<b>1</b>
San Francisco Library	-	1	3	-	<b>4</b>
Recreation & Park Department	25	35		4	<b>64</b>
Department of Technology	-	5	-	-	<b>5</b>
San Francisco Police Department	-	2	-	1	<b>3</b>
<b>Grand Total</b>	<b>170</b>	<b>586</b>	<b>44</b>	<b>20</b>	<b>823</b>

Source: Arup. Data as of June 2022.

<sup>14</sup> The keywords used to define "Heavy Equipment" in this instance include Boom Lift, Excavator, Paver, Roller, Backhoe, Grinder, Crane, Dozer, Grader, Loader, and Tractor.

<sup>15</sup> The keyword used to define "Small Offroad" in this instance includes Tractor.

<sup>16</sup> SFMTA vehicle counts only include non-revenue fleet vehicles. Revenue fleet vehicles, such as transit buses and shuttles, are not included in this data analysis because the SFMTA is currently undertaking planning and implementation to electrifying its fleet, with 100% electrification by 2035.

# CHAPTER 3: Outreach and Stakeholder Engagement

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The Outreach and Stakeholder Engagement task aimed to engage the community, interested parties and stakeholders/partners, and City departments in the development and refinement of the Blueprint to ensure that the resulting document and its contents address their concerns and interests and are implementable within the allocated timeframe. To achieve this goal, SF Environment created an engagement strategy for conducting outreach and advisory activities. Appendix B: Blueprint Engagement Plan lists out the TAC members. The Products associated with Task 3 include the Engagement Plan, Small Fleets Needs Assessment Survey, Small Fleets Needs Assessment Findings, Disadvantaged Community Needs Assessment Survey, Disadvantaged Community Needs Assessment Findings, the Technical Advisory Committee Charter, Meeting Materials, and the Blueprint Playbook. These were submitted as deliverables as part of the grant agreement's Scope of Work.

The Engagement Plan detailed plans for hosting the TAC, developing the Small Fleets Needs Assessment, completing the DAC Needs Assessment, and conducting outreach to the municipal fleet. The following sections will describe efforts taken to complete these outreach and stakeholder engagement deliverables.

## **Technical Advisory Committee**

SF Environment solicited input from communities and a wide range of internal and external stakeholders to develop strategies and ensure the proposed strategies and actions aligned with their needs, concerns, and interests. To achieve this, SF Environment established and led a new MDHD ZEV TAC during the grant performance period.

The TAC brought together public sector stakeholders, utilities, City departments, community-based organizations, local businesses, and fleet representatives directly engaged in MDHD fleet electrification in San Francisco to guide the development of the Blueprint. The TAC provided a forum for coordination and collaboration to ensure that stakeholders were able to inform and review key Blueprint components.

TAC objectives were to:

- Provide an opportunity for all members to aid in the design, development, and review of the Blueprint components and final Blueprint;
- Discuss challenges to fleet electrification and the impacts of charging siting and installation on the community;
- Share data, best practices, and messaging to develop cohesive solutions that support the Blueprint's goals; and
- Provide oversight to ensure that the resulting Blueprint and its contents fulfill their needs, address their concerns and interests, and are implementable within the allocated timeframe.

SFE hired SKS Consulting to prep, facilitate, and complete follow-up tasks for each TAC meeting. Having a neutral, third-party facilitator was important to the success of the meetings

because a facilitator provided a structured, inclusive space for group members to be productive, creative, and efficient.

The TAC met six times over the course of the grant. Each meeting involved an ice breaker and introduction followed by presentations by SF Environment staff about recent findings and potential directions for the Blueprint. The facilitator streamlined meetings and gave staff greater opportunity to engage with TAC members. At these meetings, SF Environment staff solicited feedback and guidance that helped shape the Small Fleets Needs Assessment, DAC Needs Assessment, MDHD Charging Suitability Map, Innovations Report, and the Pilot Implementation Projects.

The Blueprint's outreach and engagement led to important findings related to the municipal fleet, small- and medium-sized fleets, and disadvantaged communities.

## **Small Fleets Needs Assessment**

SF Environment developed the Small Fleets Survey to compile information on current fleet operations as well as determine barriers to ZEV adoption for small MDHD fleets. For this exercise, SF Environment defined "small fleet" as a fleet with 1 to 10 MDHD vehicles. To reach these fleets, SF Environment leveraged the Clean Cities Coalition network and used data from FleetSeek to compile contact information for fleets based in San Francisco. SFE sent out an online survey to 282 email contacts from the FleetSeek list that were San Francisco-based. Additionally, SF Environment extended distribution of the survey to fleets through The SF Market, the San Francisco Chamber of Commerce, and the San Francisco Green Business Network.

SF Environment ran three iterations of the survey to all aforementioned lists in September 2022, June 2022, and March 2023. SF Environment received only 13 responses total to the survey, despite these three outreach attempts. The project team surmised that the low response rate was in part because of outdated contact information from FleetSeek, compounded by the ordinary challenges of running email-based surveys to a hard-to-reach audience, such as small fleets not having a dedicated contact person and limited time to respond to voluntary surveys. The low response rate made it difficult to assess the specific challenges that San Francisco small fleets face in electrifying their MDHD vehicles. To increase its understanding of challenges to adoption, the project team also did outreach to larger fleets. Thus, the survey results include all fleet responses (both small and larger fleets).

To supplement the San Francisco Small Fleets Survey, SF Environment looked to gain further insight into the challenges small fleets face in adopting ZEVs by looking at a national-level survey. Dream.org, a national advocacy organization focused on promoting an equitable green economy, ran a survey of small fleet operators and interested parties to explore the anticipated barriers and recommended solutions that small and minority fleet owners have regarding the adoption of MDHD ZEVs.<sup>17</sup>

SF Environment staff also conducted informational interviews with San Francisco Meals on Wheels and CALSTART, which administers Cal Fleet Advisors, which helped shape the Small

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<sup>17</sup> Dream.org. (2022). *Supporting Small Fleets in the Transition to Zero Emission Trucks*. Retrieved from [https://dream.org/wp-content/uploads/2022/08/Dream.Org\\_SmallFleet\\_1.pdf](https://dream.org/wp-content/uploads/2022/08/Dream.Org_SmallFleet_1.pdf)

Fleets Needs Assessment and inform the Blueprint strategies and pilot implementation project proposals.

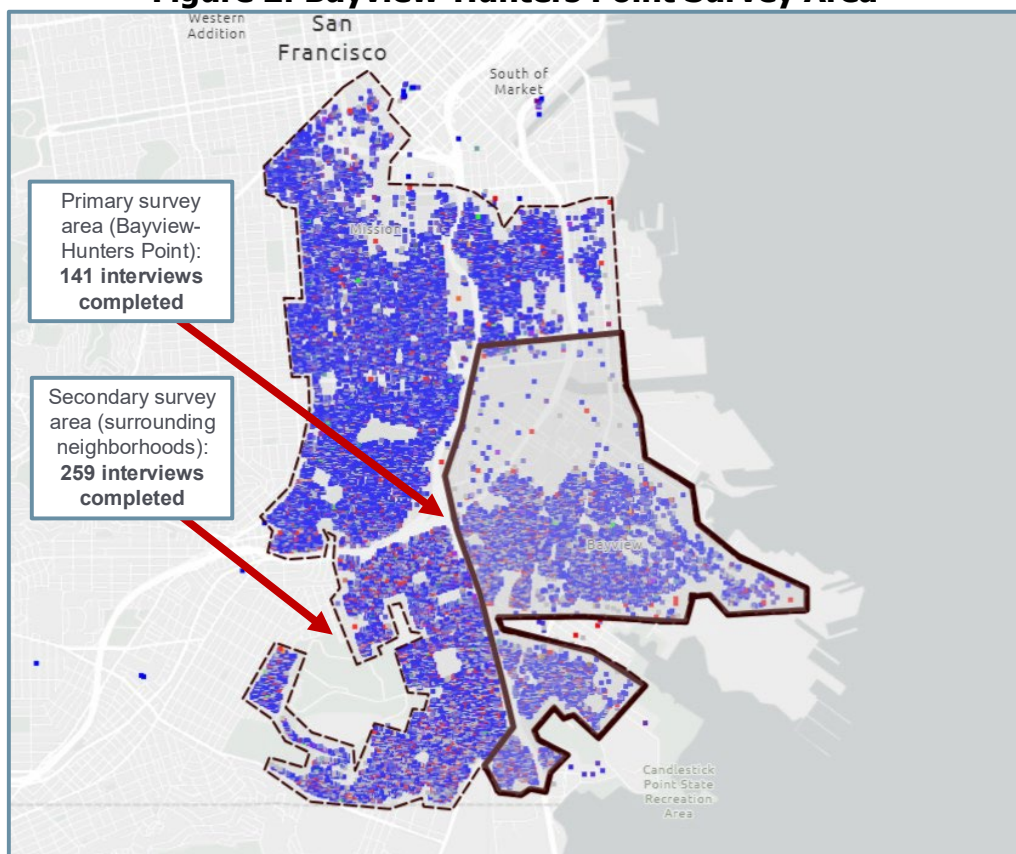
## Disadvantaged Communities Needs Assessment

The DAC Needs Assessment Survey was designed to understand community concerns over land use, traffic safety, congestion, and other impacts resulting from siting charging stations for MDHD ZEVs in underserved communities. SF Environment partnered with Strategies 360, a local polling firm, to help design and run a representative survey of residents living in the Bayview-Hunters Point neighborhood and the surrounding areas. The survey included questions on general EV interest and public charging alongside MDHD topics to gather community opinions on these related topics at the same time.

The survey included questions about car and EV ownership and usage, charging infrastructure availability and quality, attitudes towards MDHD traffic, and perceptions of the Bayview-Hunters Point neighborhood. In addition to topical questions, the survey gathered standard demographic data about age, gender, race, and income.

Strategies 360 conducted a representative survey of 400 adults in Southeast San Francisco, of which, unweighted, 141 adults were from Bayview-Hunters Point (Figure 2 below). Surveys were conducted from February 12-21, 2024. The survey polled the two sub populations to see whether there were noticeable differences between Bayview-Hunters Point residents and the surrounding areas. A mixed-mode combination of landline, cell phones, and online interviews via text message were used to ensure greater coverage of the population sampled.

**Figure 2: Bayview-Hunters Point Survey Area**



Source: Strategies 360

The margin of error for the full survey of 400 interviews is ±4.9% and the margin of error for the 141 adults in Bayview-Hunters Point is ±8.2% at the 95% confidence level. For subsamples, the margin of error is higher.

The DAC Needs Assessment Survey illustrated that Bayview-Hunters Point residents broadly support SFE’s MDHD ZEV goals, while also demonstrating the challenges that the neighborhood faces from pre-existing conditions. A lack of charging network for both personal light-duty vehicles and MDHD vehicles prevents residents and fleets from transitioning to ZEVs.

88% of Bayview-Hunters Point residents say they or someone in their household owns a personal vehicle. A plurality (49%) uses that car multiple times a day.

While Bayview-Hunters Point residents tend to think the neighborhood experiences about the same amount of car traffic as other parts of San Francisco, a majority (54%) recognize that there are more MDHD vehicles traveling through the neighborhood than other parts of the city (Figure 3 below).

**Figure 3: Bayview-Hunters Point Survey Excerpt 1**

Now, please think about medium-duty and heavy-duty vehicles like delivery trucks, buses, and semi-trucks.

Would you say that there are (PINWHEEL ROTATE) <more medium- and heavy-duty vehicles traveling through Bayview-Hunters Point than in other parts of San Francisco>, <about the same amount as in other parts in San Francisco >, or <fewer medium- and heavy-duty vehicles in Bayview-Hunters Point than in other parts of San Francisco>?

	<u>BVHP</u>	<u>ALL SE SF</u>
More than in other parts .....	54%	51%
About the same as other parts .....	29	18
Fewer than in other parts .....	11	5
--		
Not sure .....	6	25

Source: SF Environment and Strategies 360

Figure 4 below shows that the top concern about these vehicles in this neighborhood is air pollution (35% top concern), followed by safety for cyclists and pedestrians (17%). Increased traffic (13%) and taking up parking (12%) were also key concerns for survey respondents. Noise (7%) was a more minor concern, and less than 10% of survey respondents reported no concerns with MDHD vehicles. One survey respondent noted that the community has “heavy industrial [sic] workers that bring vehicles that pollute the air [and they] need to take initiative and consider using evs [sic]”.

**Figure 4: Bayview-Hunters Point Survey Excerpt 2**

Which of the following concerns you the most about medium and heavy-duty vehicles in Bayview-Hunters Point? (RANDOMIZE)

	<u>BVHP</u>	<u>ALL SE SF</u>
They pollute the air .....	35%	32%
They make roads less safe for cyclists and pedestrians .....	17	17
They cause traffic .....	13	14
They take up parking .....	12	10
They make a lot of noise .....	7	8
Other .....	7	4
None of these concern me .....	7	10
--		
Not sure .....	1	4

Source: SF Environment and Strategies 360

The outcomes of this survey informed the creation of the DAC Needs Assessment, which detailed the findings of the study and potential next steps. These findings helped shape the MDHD ZEV Adoption Strategies section and associated proposed pilot projects in the Blueprint.

## **Outreach to the Municipal Fleet**

San Francisco’s municipal fleet contains nearly 3,500 MDHD vehicles that are used across multiple departments to maintain City operations and advance City goals and priorities. CARB’s ACF regulations require that the City’s municipal MDHD fleet must begin to electrify in 2024.

To prepare for this electrification effort, SFE conducted a series of interviews of high priority departments to determine the challenges that each department faces in beginning to electrify their MDHD fleets. Interviews and site visits were conducted with the Recreation and Parks Department (REC), the San Francisco Municipal Transportation Agency (SFMTA), and the Public Works Department (DPW) with the intent of collecting information on vehicle inventory, operations, miles-traveled, and challenges to electrification.

### **Recreation & Parks Department**

SF Environment and Central Shops interviewed the REC Fleet Manager and an Electrical Supervisor to discuss the department’s fleet, parking locations, and opportunities and challenges around fleet electrification. A second, on-site interview took place at the department’s largest site, the Golden Gate Park Structural Maintenance Yard (GGP Shop). This location houses the department’s administrative offices as well as several workshops as shown in Figure 5, and parking depots for various trades including electrical, plumbing, carpentry, and more. The GGP Shop is home to roughly 100 MDHD vehicles, ranging from pickups and vans to large trucks and other heavy-duty vehicles.

**Figure 5: Workshop at Golden Gate Park Structural Maintenance Yard**



Source: SF Environment

Prior to the interviews, the REC fleet manager had done some work to explore the possibility of electrifying the REC fleet. He attended several conferences to learn about new EVs that might work for the department's fleet and engaged two different EV Service Providers (EVSPs) to determine the feasibility of installing charging infrastructure at the department's main GGP Shop location. One of the EVSPs, Blink Charging, performed a site evaluation and provided several quotes for different charging solutions.

The GGP Shop is a high-priority site for charging infrastructure because of the high number of vehicles domiciled there. The site also presents a good opportunity to pilot the electrification of specific vehicles in the department's fleet, and target vehicle types and user groups with predictable duty-cycles. For example, vehicles assigned to stationary engineers, plumbers, iron tradespeople, and heavy equipment operators see the highest daily average miles driven. These user groups alone account for over half of the vehicles at the GGP Shop as well, and most of their vehicles are pickups, which are good candidates for early electrification. Vehicles assigned to specific user groups also tend to be parked near one another and the appropriate workshop within the GGP Shop, so charging infrastructure could be concentrated in those high-priority areas. Those parking areas nearest the main electrical service panel may present the most affordable options for early installation of charging infrastructure.

### **San Francisco Municipal Transportation Agency**

SF Environment and Central Shops interviewed the SFMTA's Revenue Support Fleet Director. The initial interview consisted of a video conference to discuss the department's fleet, parking locations, and opportunities and challenges around fleet electrification. A second, on-site interview took place at the MUNI Metro East Maintenance Facility (MME). This location is headquarters for the agency's Street Operations fleet, which consists of 40 pickups and may be the best candidate for early electrification of medium-duty vehicles.

SFMTA's Fleet Director has initiated some work to begin electrifying the agency's light-duty vehicles, beginning with 13 Chevy Bolts across several parking locations. Upon procuring these first EVs, the Fleet Director needed to engage with SFMTA's Capital Programs & Construction (CP&C) team to request resources for charging infrastructure.

MUNI Metro East is a high-priority site for charging infrastructure because of the high number of pickups domiciled there and the overall size of the parking lot. Vehicles in the Street Operations group see the highest number of average daily miles driven. MME also serves as a railyard for MUNI cars. Though the main electrical service panel was unable to be located during the site visit, the Director suspects that the electrical service is robust and could accommodate many EV chargers. Further analysis by the SFPUC found that there was capacity to add an additional 192 Level 2 chargers to the site.

### **San Francisco Department of Public Works**

SF Environment and Central Shops interviewed DPW's Heavy Equipment Operations Supervisor. The initial interview consisted of a video conference to discuss the department's fleet, parking locations, and opportunities and challenges around fleet electrification. A second, on-site interview took place at the DPW Yard, shown in Figure 6. This location is home to most of the department's fleet vehicles.

**Figure 6: DPW Cesar Chavez Yard**



Source: SF Environment

DPW has initiated some work to begin electrifying the agency's light-duty vehicles and most recently ordered Ford electric pickups. The Heavy Equipment Operations Supervisor has begun exploring new models of EVs for the MDHD fleet, including attending a Peterbilt event for tractor trailers.

The DPW Yard is a high-priority site for charging infrastructure because of the high number of pickups domiciled there. There are currently roughly 14 Level 2 chargers at the site, and an additional 3-4 chargers in an adjacent employee parking lot. At this time, the site's electrical capacity is insufficient to accommodate any more charging infrastructure, and the department has been told by the utility that service upgrades may take at least 18 months.

Findings from this outreach were included in the MDHD ZEV Adoption Strategies section and Municipal Fleet Engagement Details appendix in the Blueprint.

## **Learnings**

Several important takeaways from the outreach work included a deeper understanding of the need for community outreach to small- and medium-sized fleets. These fleets often do not have staff assigned to engaging with policymakers and the community and lack the time and funding to participate in opportunities like the Blueprint. The DAC Needs Assessment

confirmed the project team's understanding of the Bayview-Hunters Point neighborhood as a critical location in need of charging due to high pollution ratings as noted on CalEnviroScreen 4.0, community concerns around the impact of the large volume of MDHD vehicles and traffic moving through the area, and broad community reliance on vehicles. The community's desire for charging in the area and input on factors for the City to consider in siting charging projects are important feedback for future charging infrastructure efforts.

Finally, municipal fleet interviews supported the project team's understanding of the variety of concerns across departments regarding MDHD adoption and helped the team identify the common desire for centralization and electrification leadership as a supportive path forward for electrification of the municipal fleet. The project team identified that prioritizing ZEV adoption for the municipal fleet would not only dramatically accelerate progress toward 2030 goals but could also pose an opportunity for the City to lead by example through shared learning with small- and medium-sized fleets.

# CHAPTER 4: MDHD Charging Suitability Map

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The goal of the MDHD Charging Suitability Map task was to identify the locations, existing electrical capacities, and upgrades required to support 10,000 MDHD ZEV by 2030.

To achieve this goal SF Environment created the MDHD Charging Suitability Map, a map focused specifically on siting charging infrastructure for MDHD EVs. Originally, SF Environment worked with Google on map development, but there were concerns about proprietary information and functionality that prohibited SF Environment from continuing work on the tool with Google. SF Environment then pivoted to working on the tool with Arup, given the existing work completed to date with Arup on data collection. Appendix C: MDHD Charging Suitability Map provides the link to the interactive Mapping Tool, while the deliverables associated with this task, including the Suitability Map Narrative, were submitted to the CEC Commission Agreement Manager as part of the Scope of Work.

The following section will show how SF Environment and Arup designed the interactive MDHD Charging Suitability Map that uses a suitability analysis based on a multicriteria weighting system.

## Data Collection

To begin the process of creating this map, SF Environment and Arup identified key data sources that could be used to help make siting decisions for MDHD charging infrastructure. SF Environment identified the following data sources:

- **2020 Caltrans Annual Average Daily Truck Traffic:** A measurement of the daily number of trucks at exits on key freeways in San Francisco. This source helps to identify high traffic truck areas for off-highway opportunity charging.
- **2023 DMV Registered San Francisco MDHD Vehicles:** A list of MDHD vehicles and their registered domicile locations by zip code. This source helps locate zip codes with high concentrations of MDHD vehicles that could potentially use public and/or shared-private charging infrastructure.
- **San Francisco Land Use Map:** San Francisco designates a land use to every parcel within City limits. Parcels zoned as manufacturing, production, distribution, and repair (PDR) are particularly strong locations for MDHD public charging infrastructure.
- **CalEnviroScreen 4.0's Disadvantaged Communities (DACs) and Low-Income Communities (LICs):** California has designated certain census tracts in the state as DACs and LICs based on several socio-economic and environmental factors. These locations face higher environmental burdens and are also eligible for increased funding opportunities from state sources. Targeting MDHD charging infrastructure in DACs and LICs will allow for faster electrification of diesel- and gas-powered trucks, reducing pollution and improving local air quality for these communities. Targeting public MDHD charging infrastructure in DACs and LICs may also better serve small business owners in these neighborhoods that own/operate small MDHD fleets and may not have the operational capacity or real estate to develop their own charging infrastructure.

- **PG&E Integration Capacity Analysis:** Power availability is a critical feasibility criterion of providing charging infrastructure, particularly for depot fast and ultra-fast charging that could serve multiple MDHD vehicles. Without power, a charging station cannot draw from the grid and provide electricity to EVs. Excess grid capacity can indicate that an area can provide the power required for MDHD charging stations.
- **SF Municipal Fleet Priority Sites:** San Francisco’s municipal MDHD fleets are required to begin transitioning to ZEVs due to the California Air Resources Board’s Advance Clean Fleets mandate. City staff have identified key City sites that currently host a large number of MDHD vehicles.

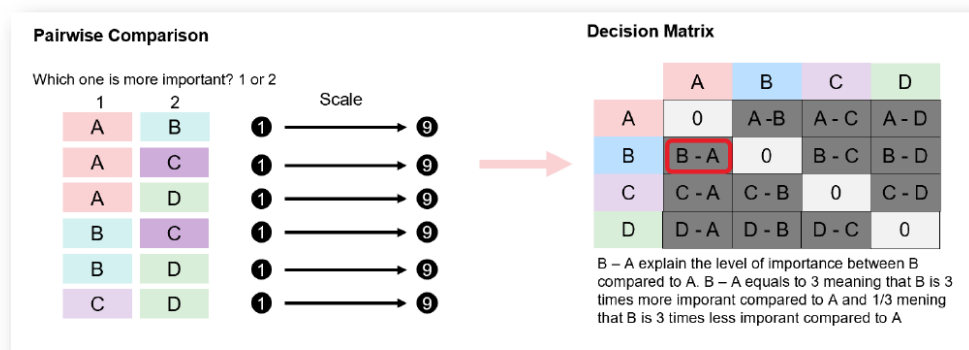
These data were gathered from public or City-managed sources and were selected because of ease of availability as well as relevance to the goal of siting MDHD EV charging infrastructure. With additional time and resources, and without having to have pivoted mid-stream to working with a different technical partner, more granular data may have been collected from private fleet operators and/or private data sources to add to the map.

### Prioritizing Data Layers

After gathering the data, Arup led a workshop on January 30, 2024 for City staff to begin to prioritize the given layers within a larger suitability analysis. City staff from SF Environment, SFPUC, Department of City Planning, County Transportation Authority, and Central Shops were all present at the meeting. Together, City staff weighed in on which data sources were the most important considerations when thinking about siting MDHD EV charging infrastructure. Arup facilitated this workshop and asked clarifying questions to ensure that participants understood the use cases for the map while also encouraging staff to think about the tradeoffs between one data source and another.

Once this workshop was complete, Arup used an Analytic Hierarchy Process (AHP), shown in Figure 5 below, to weight the criteria for the multi-criteria analysis process. AHP breaks down complex problems into a hierarchy, allowing decision-makers to compare criteria pairwise. The algorithm synthesizes these comparisons to calculate precise weights for each criterion. AHP’s strength lies in its ability to handle both qualitative and quantitative factors, offering a systematic and transparent process for criteria prioritization. While AHP is robust, the choice of criteria weighting method depends on the specific context and preferences of stakeholders.

**Figure 7: Analytic Hierarchy Process Diagram**



Source: Arup

In the workshop, City staff indicated that siting charging infrastructure in priority populations (DACs and LICs) should take precedence over all other factors. Table 3 below shows the full prioritization list. One note is that MDHD Vehicle Population scored low in part because of a specific, repeated flaw within the data. At the granular level, the data source revealed that many businesses may have registered their vehicles at the business location rather than at the location that the vehicle domiciles. Thus, many MDHD vehicles are thus shown in downtown San Francisco, even though they likely domicile and operate elsewhere within the city and the larger region.

**Table 3: MDHD Charging Suitability Mapping Tool Layer Prioritization**

Criteria	Ranking	Priority*
In Priority Population	1	26.3%
City Fleet Priority Sites	2	21.5%
Land Use	3	17.2%
Electric Grid Capacity	4	14.7%
MD/HD Vehicle Population	5	14.4%
Annual Average Daily Truck Traffic	6	5.9%

Source: Arup

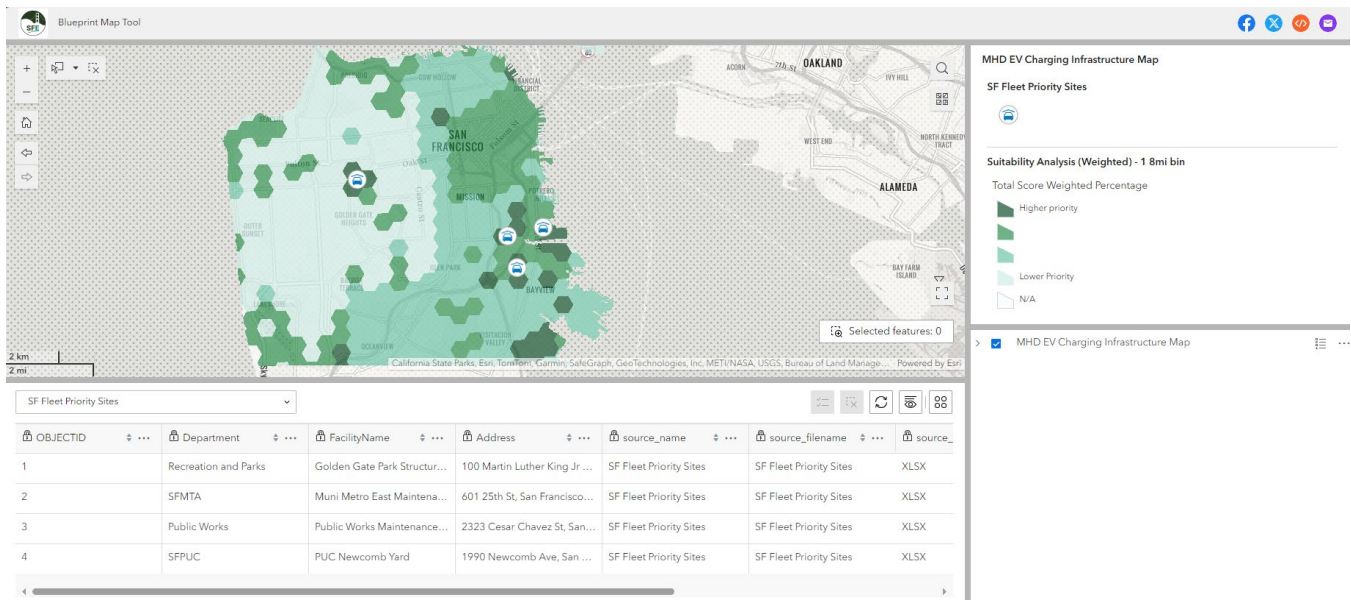
## Output: Charging Suitability Map

Arup used the data sources collected along with the feedback gathered in the staff workshop to design an interactive map on ArcGIS Online that shows the product of the multi-criteria analysis. To do this, Arup divided the city into “bins” and then applied a suitability analysis based on all the data presented. The output of this process is the [SF MDHD Charging Suitability Mapping Tool](#),<sup>18</sup> an online interactive dashboard that can be used to explore areas best suited for MDHD charging infrastructure investment. This mapping tool generated the static map show in Figure 8 below, which shows priority areas for charging investment in dark green. In addition to showing the suitability analysis, the mapping tool is able to display each of the individual layers.

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<sup>18</sup> SFE. (2025). *Blueprint Map Tool*. Retrieved from <https://experience.arcgis.com/experience/020138ad9d434f41adfeef5275383a10>.

**Figure 8: MDHD Charging Suitability Mapping Tool Sample**



Source: SF Environment *Blueprint Map Tool*

## Learnings

According to the data collected and the prioritization exercise, the highest priority region for charging investment lies within Southeast San Francisco. This is due to the presence of priority communities, public fleet priority sites, a high density of parcels designated as Production, Distribution, and Repair (PDR) by the land use code, and a high density of MDHD vehicles domiciling in the vicinity. The tool is robust enough for the City’s utility companies, including the SFPUC and PG&E, to identify priority grid upgrade needs for MDHD EV charging. As a result of this work, SFPUC is planning to incorporate GIS layers from the MDHD Blueprint Mapping Tool into its internal GIS system, where feasible, to support load planning and evaluate locations for future infrastructure investments. SF Environment can also use the tool to further inform high-priority locations for charging pilots.

At the same time, there is room to build an even more robust tool that could include data purchased from private companies—as well as additional publicly available information. For example, data sources like Streetlight can provide granular data on where MDHD vehicles are currently traveling within San Francisco to further pinpoint City charging needs. With additional data like this incorporated into the tool, SF Environment can also expand the tool regionally and share it with other jurisdictions to support interregional MDHD charging suitability planning.

# CHAPTER 5: Innovations and Policy Recommendations

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The City of San Francisco has a unique role to play in accelerating the adoption of MDHD ZEVs. As a major city that can set policy, San Francisco has an opportunity to push larger fleets to adopt MDHD ZEVs while supporting small- and medium-sized fleets to explore the transition. As the operator of its own MDHD fleet, which is one of the largest MDHD fleets domiciled within the City limits, San Francisco will need to begin adding new MDHD ZEVs starting in 2024 to comply with CARB's ACF rules. SF Environment used the MDHD ZEV Blueprint as an opportunity to not only develop strategies to accelerate MDHD ZEV adoption, but also to launch the City's transition through key actions undertaken during the Blueprint process, including gathering fleet domicile, age, and mileage information; identifying fleet manager concerns; and supporting Central Shops' engagement with funding agencies and accessing available technical assistance to begin centralizing fleet electrification efforts and planning for both light-duty and MDHD ZEV adoption for the City.

Over the course of this project, SF Environment developed several reports to deliver to the CEC as requirements of the grant. These reports, particularly the Interim Innovations Report and the Pilot Implementation Plan, were especially important to informing the final content of the Blueprint. The following section details the process of compiling these reports and adapting findings into the Blueprint.

## Innovations Report

As part of the MDHD ZEV Blueprint, SF Environment compiled a set of strategies meant to accelerate ZEV adoption for the whole MDHD ecosystem while also targeting two key audiences for more specific support: small- and medium-sized fleet operators and the City fleet. The strategies aimed to address the following areas of concern:

- Air-Quality & GHG Emissions
- Geographic Distribution & Adjacency to Disadvantaged Communities
- Grid Reliability & Resiliency
- City-Backed Funding Program
- Public-Private Partnerships
- Smart Land Use Policies
- Co-Sharing Charging Assets
- Cost Reduction & Risk Mitigation

SF Environment worked with Arup to develop the Interim Innovations Report. Arup reviewed studies completed by the City and Bay Area agencies that demonstrate goals and challenges associated with ZEV adoption for MDHD fleet operators.<sup>19</sup> These challenges include difficulty managing MDHD vehicles in the city, high costs of the initial investments in electrical infrastructure upgrades, ensuring accessibility compliance, and transition timing risks for fleets that would depend on a public charging network that will be built out over time.

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<sup>19</sup> SFE added to the report by reviewing for accuracy as well as drafting the sections on City-Backed Funding Programs, Public-Private Partnerships, and Smart Land Use Policies.

The description of each consideration or innovation area in the Interim Innovation Report identified the rationale behind the consideration or innovation, key outcomes from pursuing the innovation, potential barriers in the innovation area, and actions that can be employed to mitigate the barrier. The key City departments for supporting innovation areas or other entities that could support the actions are identified in Table 4 below. SF Environment used the findings from the Interim Innovations Report to inform the creation of the Pilot Implementation Plan.

**Table 4: Innovation Areas**

<i>Consideration/ Innovation Area</i>	<b>Lead Department</b>	<b>Supporting Department(s) &amp; Entities</b>
<i>Air-Quality &amp; GHG Emissions</i>	<ul style="list-style-type: none"> <li>SFE</li> </ul>	<ul style="list-style-type: none"> <li>Central Shops</li> <li>SFPUC</li> </ul>
<i>Geographic Distribution &amp; Adjacency to Disadvantaged Communities</i>	<ul style="list-style-type: none"> <li>SFE</li> </ul>	<ul style="list-style-type: none"> <li>City Administrators Office</li> </ul>
<i>Grid Reliability &amp; Resiliency</i>	<ul style="list-style-type: none"> <li>PG&amp;E</li> <li>SFPUC</li> </ul>	<ul style="list-style-type: none"> <li>SFE</li> <li>Private companies:               <ul style="list-style-type: none"> <li>Battery storage developers,</li> <li>Charge management software</li> </ul> </li> <li>V2G integrators</li> </ul>
<i>City-Backed Funding Program</i>	<ul style="list-style-type: none"> <li>SFE</li> </ul>	<ul style="list-style-type: none"> <li>Office of Resilience and Capital Planning</li> </ul>
<i>Public-Private Partnerships</i>	<ul style="list-style-type: none"> <li>SFMTA</li> </ul>	<ul style="list-style-type: none"> <li>Office of Resilience and Capital Planning</li> </ul>
<i>Smart Land Use Policies</i>	<ul style="list-style-type: none"> <li>SF Planning</li> </ul>	<ul style="list-style-type: none"> <li>SFE</li> </ul>
<i>Co-Sharing Charging Assets</i>	<ul style="list-style-type: none"> <li>SFE</li> <li>SFMTA</li> </ul>	<ul style="list-style-type: none"> <li>Central Shops</li> </ul>
<i>Cost Reduction &amp; Risk Mitigation</i>	<ul style="list-style-type: none"> <li>SFE</li> <li>SFMTA</li> </ul>	<ul style="list-style-type: none"> <li>California Air Resource Board (vehicles)</li> <li>Bay Area Air Quality Management District</li> <li>San Francisco Public Utilities Commission</li> <li>CEC (infrastructure)</li> </ul>

Source: Arup

## **Pilot Implementation Plan**


The strategies identified in the Interim Innovations Report and the MDHD ZEV Blueprint offer different actions the City can take to accelerate the transition to MDHD ZEVs. Implementation will be key for realizing this transition. Pilot projects are an opportunity to implement

strategies on a small scale, giving the City and its partners the ability to identify barriers and develop solutions to prepare for widespread implementation. These projects can offer valuable insights into potential challenges, costs, and overall effectiveness of a concept, mitigating risks and saving resources in the long run.

Based on the Interim Innovations Report and findings from community outreach, SF Environment identified small- and medium-sized fleets as a population in need of additional support that would benefit from potential pilot projects. SF Environment worked with Arup to review MDHD vehicle registration, traffic, and local electrical capacity data and findings from outreach and engagement with small- and medium-sized fleet operators, residents living in Bayview-Hunter’s Point and Southeast San Francisco, and City fleet managers to review the types of pilot projects that the City is in the best position to advance. Table 5 below outlines the site selection criteria framework used to determine that a publicly accessible charging hub on public (e.g., City-owned) property presents the highest pilot site opportunity.

**Table 5: Site Selection Criteria Framework**

Location	Off-street				On-street
Owner	Private <i>Individual, business, or EV network provider</i>		Public <i>Public property, funded and/or managed publicly</i>		Public <i>Public property, funded and/or managed publicly</i>
Charger Access	Privately accessible only (e.g. business owners’ vehicles)	Publicly accessible at private lot or garage	Public charging hub	Distributed chargers (e.g. library, civic center)	Curbside
Primary Barriers	<ul style="list-style-type: none"> <li>High costs and permitting challenges</li> <li>Potential grid upgrades</li> <li>Access to funding and technical resources</li> </ul>	<ul style="list-style-type: none"> <li>High costs and permitting challenges</li> <li>Potential grid upgrades</li> <li>Some sites may not be sized for MD/HD vehicles</li> </ul>	<ul style="list-style-type: none"> <li>Large site availability</li> <li>Permitting time and costs</li> <li>Potential grid upgrades</li> <li>Ensuring hub meets all users’ varied needs</li> <li>Concentrated power availability</li> </ul>	<ul style="list-style-type: none"> <li>Widespread site availability</li> <li>Many individual permits required</li> <li>Management of distributed chargers is more challenging</li> </ul>	<ul style="list-style-type: none"> <li>Permitting time and costs</li> <li>Enforcement effort required</li> <li>High costs if not deployed on existing utility infrastructure</li> <li>Access concerns for trucks</li> </ul>
Support From City Department	Provide access to educational resources such a point of contact for all charging related questions (funding, permitting, etc.)	Provide access to educational resources such a point of contact for all charging related questions (funding, permitting, etc.)	<ul style="list-style-type: none"> <li>Lead engagement with businesses and operators</li> <li>Work with other departments to manage the deployment of the charging hub</li> </ul>	<ul style="list-style-type: none"> <li>Lead engagement with businesses and operators</li> <li>Work with other departments to ensure consistency in deployment between sites</li> </ul>	Work with other departments to ensure consistency in deployment and suitability to MD/HD vehicles in areas with high truck traffic
Pilot Site Opportunity	Opportunity to influence, but not part of SFE-led pilot	Opportunity to influence, but not part of SFE-led pilot	High	Moderate	Opportunity to influence, but not part of SFE-led pilot


  
 Anticipated lowest barrier pilot site type

Source: Arup

To support these small- and medium-sized fleets, SF Environment proposed two pilot projects geared towards specific cohorts of fleets. These pilot projects are:

1. A Charging Pilot at The SF Market for multiple Medium-Duty Vehicle Fleets
2. A Shared Charging Pilot at Pier 96 with The Port of San Francisco for Heavy-Duty Vehicles

The Pilot Implementation Plan describes the plan for each pilot project including the problem being addressed, the project goal and approach, and the potential impact the pilot project can have on the problem.<sup>20</sup>

Funding is the prime requirement for advancement of these pilot projects. SF Environment, through this Blueprint development process, has strengthened its relationship with The SF Market, which has reiterated its commitment to participating in a pilot led and administered by SF Environment at their campus, components of which are shown in Figures 9 and 10. Additionally, the Port of San Francisco is developing a feasibility study for its Pier 96 site and will share findings with SF Environment to understand next steps for the pilot.

**Figure 9: Central parking area at The SF Market**



Source: SF Environment

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<sup>20</sup> Initially, the project team included a third “pilot”—a technical assistance program for small- and medium-sized fleets, but per the advice of CEC, this project was shifted to an action under Strategy A in the Blueprint.

**Figure 10: Tenant's loading dock at The SF Market**



Source: SF Environment

Funding, however, is a shifting environment, and while the passage of major federal and state legislation has created several funding opportunities for the ZEV transition, it is unclear how the landscape will change in the coming years. SF Environment put together a funding matrix highlighting currently available funding sources that can be used to identify opportunities for different pilot projects, which is included in the Pilot Implementation Plan. While SF Environment has identified some potential funding sources, ongoing research is required as administrations both locally and federally are changing. Continued collaboration between SF Environment and the CEC could help identify additional funding sources for implementation.

## **Learnings**

In addition to continually identifying funding opportunities, ongoing communication with both The SF Market and the Port of San Francisco are critical as they move forward with internal MDHD ZEV adoption and infrastructure planning efforts, as pilot goals may change. SF Environment must be certain that it does not push for a pilot that does not expressly benefit the fleet operators and communities that the pilot intends to serve. SF Environment also noted that fleet outreach and technical assistance are two key ways to support small- and medium-sized fleets, and included an action in the Blueprint to launch a Fleet Engagement and Technical Assistance program as part of Strategy A.

## CHAPTER 6: Assessment of Success

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SF Environment has completed an actionable Blueprint with collaboration from City fleet managers, local fleet operators and property owners, external partners, and several City departments. The key strategies from which all the actions in the Blueprint flow are:

- Jumpstart the ZEV Transition for Small- and Medium-Sized Fleets
- Strengthen the MDHD ZEV Ecosystem
- Convert the Municipal Fleet to ZEVs

Entering into the Blueprint process, SF Environment had a strong understanding of the process needed to identify the key challenge areas for San Francisco’s MDHD fleets to transition to ZEV. By prioritizing the stakeholder/partner engagement process, including creating and facilitating the TAC and surveying and/or interviewing local small fleets, City fleet operators, and residents of key communities that experience heavy MDHD traffic, the project team confirmed and expanded on its initial hypotheses about fleet needs. The process enabled the team to also gain critical insights on what specific strategies and actions the City needed to include in the Blueprint, as well as what SF Environment, as the lead agency responsible for advancing Blueprint implementation, needs to do in order to ensure the City meets its 2030 goals.

Engaging in each of these tasks helped the project team to identify unique challenges that small- and medium-sized fleets, the municipal fleet, and the City overall must overcome to reach the City’s 2030 and 2045 goals. The process helped to highlight—and even launched the City into advancing—opportunities to address the issues, while also helping to surface additional challenges that only moderately impacted the success of the development of the Blueprint. More importantly, these challenges informed the City on key milestones that would ensure actions outlined in the Blueprint can be implemented. These include:

1. Advance pilot charging projects by strengthening stakeholder relationships and identifying funding — SF Environment is aware of a number of forthcoming funding opportunities from state and regional entities for transportation electrification and will collaborate and/or lead on relevant opportunities with pilot partners.
2. Launch a local Fleet Engagement and Technical Assistance program for small- and medium-sized fleets — SF Environment has identified funding to allocate to this Blueprint action and aims to initiate this outreach and support effort as early as 2025.
3. Establish a City Fleet ZEV Transition and Infrastructure Plan — This work is in process and pending contracting with a regionally-funded technical consultant; SF Environment collaborates regularly with Central Shops and supports fleet inventory efforts and will continue to identify and support proposal development for fleet transition funding.

Overall, the process of developing the MDHD ZEV Blueprint was successful, as it not only resulted in a comprehensive and actionable Blueprint, but also deepened SF Environment’s relationship with partners while also facilitating new relationships with critical entities. Many of these entities now look to SF Environment as MDHD ZEV subject matter experts and are prepared to engage with SF Environment to implement the actions laid out in the Blueprint. These entities also look to SF Environment as a leader in identifying, sharing, and participating

in proposal development for funding to implement the plan. With this work done, and the Blueprint marking the pathway, San Francisco has already moved closer to the City's 2030 goals.

## Challenges and Opportunities

As often happens, the biggest challenges identified during the process of developing the Blueprint are also the greatest opportunities for ensuring implementation of Blueprint strategies. These challenges and opportunities also map to the milestones noted above.

1. **Securing commitments from stakeholders to participate in solutions prior to completing technical planning and identifying accessible funding sources** — SF Environment worked closely with The SF Market and the Port of San Francisco to understand needs and next steps for shared charging pilots. Although both entities expressed interest in implementing a specific pilot project, as their individual ZEV planning efforts advanced during the development of the Blueprint, uncertainties regarding pilot implementation timelines, preferred structures for their diverse fleet operators, and likely governance models limited the level of commitment to specific project concepts that these entities could make as part of the final Blueprint. As a result, SF Environment will maintain and strengthen its relationships with The SF Market and the Port of San Francisco to obtain ongoing updates on their ZEV planning efforts as they adapt the pilot projects to suit their evolving needs. SF Environment will also continue identifying funding sources to enable implementation of these adapted pilots. SF Environment is committed to taking the lead with these partners to apply to funding opportunities.
2. **Small- and medium-sized fleets are hard to reach** — SF Environment began small fleet engagement during execution of the outreach task but was only able to connect with 13 fleets despite three rounds of outreach. As a result, the Blueprint prioritizes targeted, on-the-ground small- and medium-sized fleet outreach as a key action to ensure the City understands what these fleets need and how to provide them with resources to address their barriers to adoption. SF Environment will also continue to work with The SF Market and the Port of San Francisco on identifying the range of knowledge gaps and priorities Market merchant and Port tenant fleets have to inform broad outreach efforts to small- and medium-sized fleets throughout the city.
3. **The confluence of barriers to City fleet transition** — SF Environment and Central Shops identified the City's unique decentralized fleet management system, a lack of dedicated funding, a lack of ZEV models suitable for city demands, concerns about ZEV reliability during emergencies, a lack of electrical capacity to install onsite charging for MDHD ZEVs, and a need for ZEV education as the confluence of barriers for the City. During the execution of the outreach task, SF Environment launched fleet vehicle composition and domicile location data compilation to help the City move in a more centralized direction, and SF Environment is continuing its work with Central Shops to identify funding opportunities and participate in funding proposal development.

## Conclusion and Next Steps

This Final Report evaluates the effectiveness of the project team's success in achieving the original goals laid out in the project's scope of work and in providing energy-related benefits to California residents through the development and future implementation of the MDHD ZEV

Blueprint. It offers a detailed account of the project's purpose, approach, activities performed, and results achieved. Furthermore, the Report presents a public assessment of the project's success, insightful observations based on the results, and recommendations for future projects and improvements.

### **Data Inventory and Analysis**

**Conclusion:** According to the data collected and the prioritization exercise, the highest priority region for charging investment lies within Southeast San Francisco. This is due to the presence of priority communities, public fleet priority sites, a high density of parcels designated as PDR by the land use code and a high density of MDHD vehicles domiciling in the vicinity.

**Next Steps:** SF Environment will focus outreach and pilot project efforts in Southeast San Francisco and will work with Central Shops to prioritize transition of MDHD ZEV at municipal hubs and lots in this area.

### **Outreach and Stakeholder Engagement**

**Conclusion:** Outreach and engagement efforts across three primary audiences (small- and medium-sized fleet operators, DACs, and municipal fleet operators) identified a need for financial incentives, targeted engagement and technical assistance, and infrastructure support including opportunities for shared charging and coordinated utility planning. Municipal fleet interviews supported the project team's understanding of the variety of concerns across departments regarding MDHD ZEV adoption and helped the project team identify the common desire for centralization and electrification leadership as a supportive path forward for electrification of the municipal fleet.

**Next Steps:** SF Environment will launch outreach to support a local engagement and technical assistance program for small- and medium-sized fleets, advance the identified pilot charging projects, and prioritize collaboration with Central Shops to advance ZEV adoption for the municipal fleet. This will dramatically accelerate progress toward 2030 goals and is an opportunity for the City to lead by example through shared learning with small- and medium-sized fleets.

### **MDHD Charging Suitability Map**

**Conclusion:** The mapping tool is robust enough for the City to identify priority sites for MDHD EV charging. At the same time, there is room to build an even more robust tool that could include data collected from private fleet operators or purchased from private companies. For example, data sources like Streetlight can provide granular data on where MDHD vehicles are currently traveling within San Francisco to further pinpoint city charging needs. With additional data like this incorporated into the tool, SF Environment can also expand the tool regionally and share it with other jurisdictions to support interregional MDHD charging infrastructure planning.

**Next Steps:** As a result of this work, SFPUC is planning to incorporate GIS layers from the MDHD Blueprint Mapping Tool into its internal GIS system, where feasible, to support load planning and evaluate locations for future infrastructure investments. SF Environment will also update the tool as it gathers additional data on private fleet domicile locations and/or operations to further inform high priority locations for future charging pilots and/or grid infrastructure investment.

## **Innovations and Policy Recommendations**

**Conclusion:** Pilot charging projects for multiple small- and medium-sized fleets on City property at The SF Market and the Port of San Francisco can have the greatest impact on near-term MDHD ZEV adoption. Funding is the primary requirement for advancement of these pilot projects. SF Environment, through this Blueprint development process, has strengthened its relationship with The SF Market, which has reiterated its commitment to participating in a pilot at the campus, led and administered by SF Environment. Additionally, the Port of San Francisco is developing a feasibility study for its Pier 96 site and will share findings with SF Environment to understand next steps for the pilot.

**Next Steps:** Funding is a shifting environment, and while the passage of major federal and state legislation has created several funding opportunities for the ZEV transition, it is unclear how the landscape will change in the coming years. As SF Environment works to identify funds, it will continue strengthening relationships with The SF Market and the Port of San Francisco as they move forward with internal MDHD ZEV adoption and infrastructure planning efforts to ensure the pilots benefit the communities intended.

By systematically addressing the problem through data collection, stakeholder and community outreach, and the development of informed solutions, San Francisco has laid a solid foundation for reducing emissions and promoting sustainable MDHD transportation. The findings detailed in the Blueprint will serve as a valuable guide for ongoing and future efforts to transition to a cleaner, healthier, and more equitable transportation system, reinforcing San Francisco's role as a leader in environmental sustainability and climate action.

# GLOSSARY

ALTERNATIVE FUEL DATA CENTER (AFDC)<sup>21</sup> – An office under the Department of Energy (DOE)'s Office of Energy Efficiency and Renewable Energy (EERE) that provides information, data, and tools to help fleets, fuel providers, policymakers, cities, states, Clean Cities and Communities coalitions, and other transportation decision makers find ways to reach their energy, environmental, and economic goals through the use of alternative and renewable fuels, advanced vehicles, and other fuel-saving strategies.

ANALYTIC HIERARCHY PROCESS (AHP)<sup>22</sup> – A structured technique for organizing and analyzing complex decisions. AHP breaks down both qualitative and quantitative factors of complex problems into a hierarchy, allowing decision-makers to compare and prioritize criteria.

CALIFORNIA AIR RESOURCES BOARD (ARB) -- The "clean air agency" in the government of California, whose main goals include attaining and maintaining healthy air quality; protecting the public from exposure to toxic air contaminants; and providing innovative approaches for complying with air pollution rules and regulations.

CALIFORNIA DEPARTMENT OF TRANSPORTATION (Caltrans) -- is responsible for the design, construction, maintenance, and operation of the California State Highway System, as well as that portion of the Interstate Highway System within the state's boundaries.

CALIFORNIA ENERGY COMMISSION - The state's primary energy policy and planning agency. The agency was established by the California Legislature through the Warren-Alquist Act in 1974. It has seven core responsibilities:

- Developing renewable energy
- Transforming transportation
- Increasing energy efficiency
- Investing in energy innovation
- Advancing state energy policy
- Certifying thermal power plants
- Preparing for energy emergencies

CALIFORNIA COMMUNITIES ENVIRONMENTAL HEALTH SCREENING TOOL (CalEnviroScreen 4.0)<sup>23</sup> – A screening methodology that can be used to help identify California communities that are disproportionately burdened by multiple sources of pollution.

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<sup>21</sup> DOE Alternative Fuels Data Center Home Page: <https://afdc.energy.gov>

<sup>22</sup> ScienceDirect: The analytic hierarchy process—what it is and how it is used. Retrieved from <https://www.sciencedirect.com/science/article/pii/0270025587904738>

<sup>23</sup> CalEnviroScreen 4.0 Home Page: <https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-40>

SAN FRANCISCO OFFICE OF THE CITY ADMINISTRATOR—CENTRAL SHOPS (Central Shops) – The Central Shops Department provides high quality, cost effective and sustainable fleet management and maintenance services to City departments.<sup>24</sup>

DISADVANTAGED COMMUNITY (DAC)<sup>25</sup> – Disadvantaged Communities refer to the areas throughout California which most suffer from a combination of economic, health, and environmental burdens.

ELECTRIC VEHICLE (EV) – A broad category that includes all vehicles that are fully powered by Electricity or an Electric Motor.

EMISSIONS – Released or discharged air contaminants in the ambient air from any source.

MEDIUM-AND HEAVY-DUTY (MDHD)<sup>26</sup> – Medium- (Classes 2b to 6) and Heavy-Duty (Classes 7 and 8) vehicles

LOW CARBON FUEL STANDARD (LCFS) -- A set of standards designed to encourage the use of cleaner low-carbon fuels in California, encourage the production of those fuels, and therefore, reduce greenhouse gas (GHG) emissions. The LCFS standards are expressed in terms of the "carbon intensity" (CI) of gasoline and diesel fuel and their respective substitutes. The LCFS is a key part of a comprehensive set of programs in California to cut greenhouse gas emission and other smog-forming and toxic air pollutants by improving vehicle technology, reducing fuel consumption, and increasing transportation mobility options.

LOW-INCOME COMMUNITY (LIC)<sup>27</sup> – Census tracts that are either at or below 80% of the statewide median income, or at or below the threshold designated as low-income by the California Department of Housing and Community Development's 2016 State Income Limits.

SAN FRANCISCO ENVIRONMENT DEPARTMENT (SF Environment)<sup>28</sup> – Created by voter mandate in 1996, the San Francisco Environment Department is the lead municipal agency coordinating the implementation of San Francisco's Climate Action Plan.

SAN FRANCISCO MUNICIPAL TRANSPORTATION AGENCY (SFMTA)<sup>29</sup> – San Francisco Municipal Transportation Authority – A public agency created by consolidation of the San Francisco Municipal Railway, the Department of Parking and Traffic, and the Taxicab Commission. The

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<sup>24</sup> City and County of San Francisco. (2025). *Central Shops*. Retrieved from: <https://www.sfgov.org/agency/central-shops>.

<sup>25</sup> California Environmental protection Agency SB 535. Retrieved from [https://calepa.ca.gov/wp-content/uploads/sites/6/2022/05/Updated-Disadvantaged-Communities-Designation-DAC-May-2022-Eng.a.hp\\_1.pdf](https://calepa.ca.gov/wp-content/uploads/sites/6/2022/05/Updated-Disadvantaged-Communities-Designation-DAC-May-2022-Eng.a.hp_1.pdf)

<sup>26</sup> U.S. Department of Energy (DOE) and the U.S. Environmental Protection Agency (EPA). (2024). A Report on Actions for Medium- and Heavy-Duty Vehicle Energy and Emissions Innovation. Retrieved from <https://www.epa.gov/system/files/documents/2024-12/mdhd-action-plan.pdf>. Source: Doe Reference to specific commercial products, manufacturers, companies, or trademarks does not constitute its endorsement or recommendation by the U.S. Government or the Department of Energy.

<sup>27</sup> California Energy Commission. (2024). Low-Income or Disadvantaged Communities Designated by California. Retrieved from <https://cecgis-caenergy.opendata.arcgis.com/datasets/CAEnergy::low-income-or-disadvantaged-communities-designated-by-california-1/explore?location=37.767951%2C-122.465671%2C12.34>.

<sup>28</sup> City and County of San Francisco. (2025) San Francisco Environment Department. Retrieved from <https://www.sfenvironment.org>

<sup>29</sup> City and County of San Francisco. (2025) San Francisco Municipal Transportation Agency. Retrieved from <https://www.sfmta.com>

agency oversees public transport, taxis, bicycle infrastructure, pedestrian infrastructure, and paratransit for the City and County of San Francisco.

**TECHNICAL ADVISORY COMMITTEE (TAC)** – Technical Advisory Committee composed of public sector partners, utilities, City departments, community-based organizations, local businesses, and fleet representatives directly engaged in MDHD fleet electrification in San Francisco to guide the development of the Blueprint.

**ZERO-EMISSION VEHICLE (ZEV)** – Vehicles which produce no emissions from the on-board source of power (e.g., an electric vehicle).

# **APPENDIX A:**

## **Data Collection and Analysis**

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As outlined in the Scope of Work Task 2 – Inventory and Analysis, SF Environment collected and analyzed data to help determine the energy demand and number of chargers required and to support decision-making and development of the Blueprint for MDHD ZEVs by establishing a MDHD baseline and segmentation. The Products associated with this Task include the Data Collection Plan and the Data Collection and Analysis Report. These are accompanying this Report as Appendix A.

# APPENDIX B:

## Blueprint Engagement Plan

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As outlined in the Scope of Work Task 3 – Outreach and Stakeholder Engagement, SF Environment engaged the community, stakeholders, and City departments in the refining and development of the Blueprint to ensure that the resulting document and its contents fulfill their needs, address their concerns and interests, and are implementable within the allocated timeframe. The Products associated with this Task include the Engagement Plan, Small Fleets Needs Assessment Survey, Small Fleets Needs Assessment Findings, Disadvantaged Community Needs Assessment Survey, Disadvantaged Community Needs Assessment Findings, the Technical Advisory Committee Charter, and Meeting Materials, and the Blueprint Playbook. These were submitted as deliverables as part of the grant agreement’s Scope of Work. The Technical Advisory Committee members are listed below.

**Table 6: Technical Advisory Committee Members**

Category	Organization	Committee Member	Designated Alternate
Advocacy / Industry Council	CALSTART	Jasna Tomic	Valerie Thorsen
Charging Provider	InCharge Energy	Obrie Hostetter	Ashley Levi
Charging Provider	EVgo	Jonah Eidus	Romic Aevaz
Charging Provider	WattEV	Salim Youssefzadeh	
City Department	SF Municipal Transportation Agency	Gino Potter	
City Department	SF Office of the City Administrator – Central Shops	Don Jones	
City Department	SF Department of Public Works	John Leal	
City Department	SF Recreation & Parks Department	Johnny Wong <sup>30</sup>	
Clean Cities Coalition	Sacramento Clean Cities Coalition	Tim Taylor	
Community-Based Organization	Leaders for Environmental Activism Reclaiming Their Health (Leaders4E.A.R.T.H) – Mission Neighborhood Center	Augie Angel	Malik Dennis
Community Partner	SFE Racial Equity Team	Raymond Manion	Sraddha Mehta
Local Business	The SF Market	Michael Janis, Catherine Van Dyke, Mark Biedlingmaier	Nathan Matson, Sergio Solis
Local Business	Meals on Wheels	Frank Scott	Greycy Portillo
Original Equipment Manufacturer	Golden Gate Truck Center (Freightliner, Kenworth, Isuzu, Western Star)	Don MacInnes	Ernie Contreras
Utility	PG&E	Glenn Esguerra	
Utility	San Francisco Public Utilities Commission	Don Lampe	Jason Bernardo

Source: SFE.

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<sup>30</sup> Johnny Wong joined the Committee as an employee of the San Francisco Recreation & Parks Department and continued to participate after starting a new position at the San Francisco Police Department in 2023.

# **APPENDIX C:**

## **MDHD Charging Suitability Map**

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As outlined in the Scope of Work Task 4 – Create the Charging Infrastructure Map, SF Environment identified priority charging locations and existing electrical capacities to support 10,000 MDHD ZEV by 2030 through the development of an interactive tool. The Products associated with this task include a link to the Blueprint Mapping tool (below) and the Charging Infrastructure and Map Narrative. The link to the mapping tool is below and the Map Narrative was submitted as a deliverable for Task 4.

[SFE MDHD Charging Web App](#)

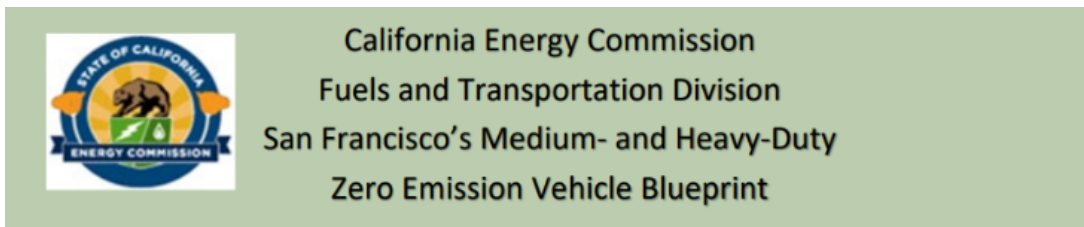
<https://experience.arcgis.com/experience/020138ad9d434f41adfeef5275383a10>

# APPENDIX D:

## Fact Sheet

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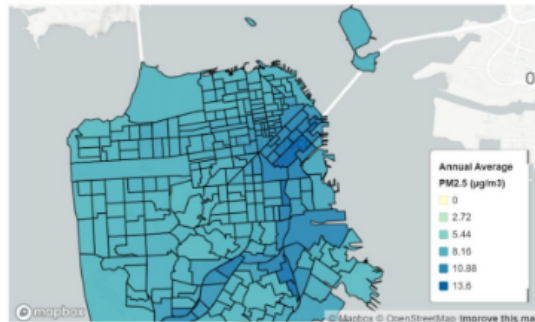
As outlined in the Scope of Work Task 6 – Project Fact Sheet, the goal of this task is to develop an initial and final project fact sheet that describes the CEC-funded project and the benefits resulting from the project for the public and key decision-makers. The Products associated with this task included the Initial and Final Project Fact Sheets, as well as high quality digital photographs. The Final Project Fact Sheet images are below.



### The Issue

San Francisco currently does not have sufficient charging infrastructure to reach its goals of transitioning 10,000 medium and heavy duty (MDHD) vehicles to zero emission vehicles (ZEVs) by 2030 and 100% MDHD ZEV by 2045. The MDHD ZEV Blueprint identifies three strategies to accelerate progress toward these goals: jump-start the ZEV transition for small- and medium-sized fleets, build a strong MDHD ZEV ecosystem that facilitates deployment of charging infrastructure, and convert the municipal fleet to ZEV. Southeast San Francisco has been identified as a priority location for implementing Blueprint strategies. The majority of the city's MDHD traffic impacts neighborhoods in Southeast San Francisco, which are disproportionately burdened by diesel particulate matter and are disadvantaged communities (DACs) on CalEnviroScreen 4.0.

Annual average concentration of PM2.5 ( $\mu\text{g}/\text{m}^3$ ) by census tract, San Francisco, 2020



Map of PM2.5 Concentration. Source: San Francisco Dept. of Public Health

### Project Innovation and Advantages

The MDHD ZEV Blueprint, aligned with the City's existing policy frameworks, promotes equity, public health, and economic vitality. All actions and tasks in the Blueprint are designed to create a more livable and equitable San Francisco, address disparities in charging options and services for small- and medium-sized fleets, and reduce air pollution from MDHD vehicle emissions along major traffic corridors. Key project features include:

- An online, interactive Charging Suitability Mapping Tool that can be used to explore areas best suited for MDHD charging infrastructure investment
- Identification of ZEV adoption barriers for City-owned and small private fleet operators
- A proposal to increase education and technical assistance for small/medium fleets
- Investigation of land use policy and workforce development programming to facilitate the adoption of ZEVs and installation of infrastructure
- Advancement of pilot projects serving small/medium and independent fleets

### Project Benefits

The Blueprint will accelerate local and regional compliance with Advanced Clean Trucks (ACT) and Fleets (ACF) Regulations and develop new economic opportunities in ZEV truck and charging infrastructure installation and maintenance while helping the City meet its goals.



## California Energy Commission Fuels and Transportation Division San Francisco's Medium- and Heavy-Duty Zero Emission Vehicle Blueprint

- **Greenhouse Gas Emissions Reduction:** Using the Argonne National Lab HD Vehicle Emissions Calculator, SF Environment estimates that replacing 1,000 diesel single-unit short haul trucks in these neighborhoods with electric-equivalent will result in a potential GHG emission reduction of 248,842 short tons, nearly 2,000,000-lbs of NOx, and nearly 8,000-lbs of PM 2.5.
- **Impact to Low-Income and Hard-to-Reach Communities:** ZEV adoption for small- and medium-sized fleets (fewer than 50 MDHD) is difficult due to slim profit margins, poor cash flow, less staff time and upfront funds to take advantage of available vehicle incentive/rebate programs, and more. The Blueprint targets these fleets for participation in charging pilot projects and develops a robust engagement program to support these fleets in accessing available incentives and technical assistance.
- **Interagency Coordination:** SF Environment collaborated with municipal departments and external partners to develop the Blueprint, which will provide the City and its partners an ongoing focus for continued collaboration to update and implement the Blueprint as partner plans, available technology, and funding opportunities evolve.

### Lessons Learned

To develop the solutions and interventions included in the Blueprint, SF Environment conducted four distinct tasks: Data Inventory and Analysis, Outreach and Stakeholder Engagement, Charging Suitability Map Creation, and Innovations and Policy Recommendations. Key Learnings for each task are:

- According to the **data collected and the siting criteria prioritization** exercise, the highest priority region for charging investment lies within Southeast San Francisco.
- **Outreach and engagement** efforts across three primary audiences (DACs, municipal fleet operators, and small- and medium-sized fleet operators) identified a need for financial incentives; infrastructure support including opportunities for shared charging and coordinated utility planning; and targeted, on-the-ground outreach and technical assistance.
- **The MDHD Charging Suitability Mapping Tool** is a robust tool for the City to identify priority sites for MDHD EV charging and can be built upon to include more granular data to further pinpoint charging needs in the future.
- **Innovative pilot charging projects** for multiple small- and medium-sized fleets on City property at the Port of San Francisco and The SF Market can have the greatest impact on near-term MDHD ZEV adoption. Funding and in-depth fleet operator engagement are the primary requirements for advancement of these pilot projects.

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Amount: \$199,885

Co-funded Amount: \$7,150

Project Location(s): San Francisco, CA

Project Team: San Francisco Department of the Environment, Arup North America Ltd

# APPENDIX E:

## Blueprint

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As outlined in the Scope of Work Task 7 – Blueprint, SF Environment developed a comprehensive blueprint that supports charging for all MDHD ZEVs, with a focus on municipal and small- and medium-sized commercial fleets. The Products associated with this task are an outline of the Blueprint, a draft Blueprint, and the Final Blueprint. The Final Blueprint document can be found on the CEC’s website at [https://www.energy.ca.gov/sites/default/files/2025-04/Final\\_Blueprint\\_ARV-21-013\\_SF\\_MDHD-ZEV\\_Blueprint\\_ADA.pdf](https://www.energy.ca.gov/sites/default/files/2025-04/Final_Blueprint_ARV-21-013_SF_MDHD-ZEV_Blueprint_ADA.pdf).