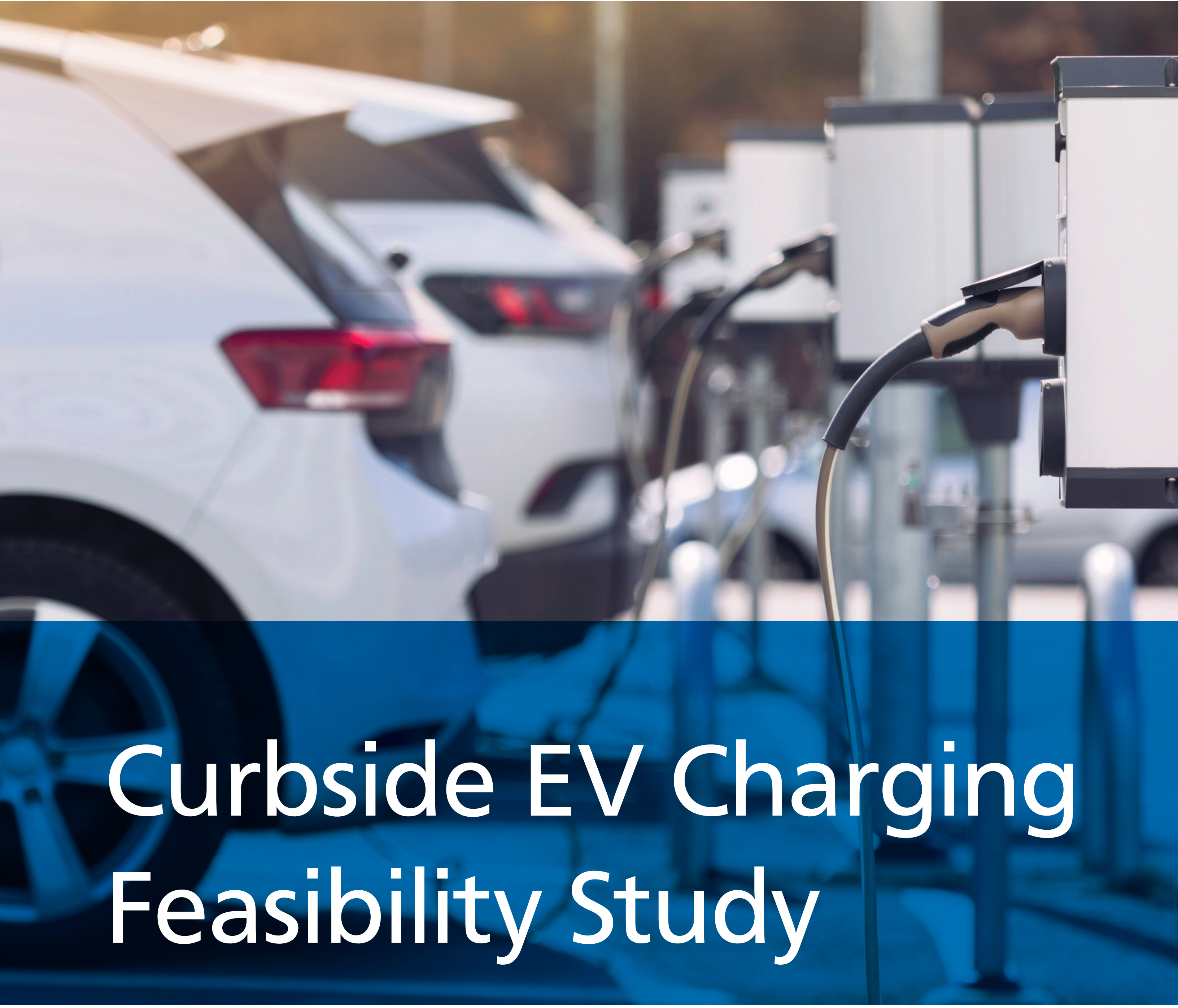


Curbside EV Charging Feasibility Study

April 2025

SFMTA

Executive Summary

San Francisco's transportation sector generates nearly half of the city's greenhouse gas emissions from private cars and trucks, which drives a rapidly changing climate system and creates health burdens upon local communities. Shifting auto based trips that are powered by carbon intensive petroleum to ones that run on electric battery power is one of the key steps towards achieving the City's climate goals when combined with reducing overall automobile trips by shifting to transit, bikes and walking. One of the primary drivers of this transition is California's Advanced Clean Cars II regulation which requires all new passenger cars, trucks, and SUVs sold in California to be zero-emission vehicles by 2035. As of 2024, electric vehicle adoption rates in California and San Francisco continue to increase and lead the nation in adoption of electric vehicles (EV's). San Francisco is planning now so that it is ready to support the charging demands of these vehicles as they enter the transportation system.

While California is currently requiring that vehicles switch from petroleum to electric power, the current national policy environment for California's ability to require this is unclear.

Therefore, San Francisco is continuing its commitment to ensuring that the availability of public charging infrastructure is not an impediment to transitioning the transportation sector so that it is less reliant on petroleum.

San Francisco's Climate Action Plan has identified on-street, curbside electric vehicle (EV) charging, along with off-street charging in public and private parking lots and private charging (in private garages), as important in meeting the charging needs of San Francisco's residents, businesses and visitors. As approximately 65% of households in San Francisco rent their homes, often in older, garage-less, multifamily apartment buildings, there is a large population of residents who will rely on public curbside EV chargers. Currently, there are approximately 1,150 publicly accessible charging stations in San Francisco, located on both public and private property, and a 2020 analysis conducted for the city estimates that San Francisco will need approximately 600 additional publicly accessible chargers by 2030 to meet projected demand. These charging stations will be a combination of off-street and curbside units.

The curb and the public right of way are important public resources, support a complicated array of infrastructure governed and managed by multiple agencies, and experience high demand for parking and loading. Furthermore, curbside charging is a new and evolving technology and business venture and as such there are an array of risks and opportunities associated with installing, maintaining and operating a public curbside charging network.

In June of 2024, the Board of Supervisors passed Resolution No. 326-24 which supports this Curbside EV Charging Feasibility Study. This feasibility study was conducted by the consulting firm Arup, in collaboration with staff from the San Francisco Municipal Transportation Agency, San Francisco Environment Department, San Francisco Public Works, San Francisco Public Utilities Commission, and other key City stakeholders.

The study analyzed six key areas to identify friction points, hurdles and roles that need to be resolved to ensure San Francisco can successfully implement a curbside charging pilot as it works to realize its climate goals. These include: permitting, jurisdiction and decision-making, electrical grid capacity, site suitability and accessibility needs, financial feasibility, and equity considerations. The study also conducted an intensive literature review and developed case studies for peer cities that have more mature curbside charging programs and engaged key stakeholders and charging industry leaders to inform the report's findings.

While this study was underway in mid-2024, San Francisco's Mayor London Breed initiated the first phase of a curbside charging pilot via the Mayor's Curbside Electric Vehicle Charging Pilot which leverages partnerships with industry partners to install the first phase of public curbside chargers. As this parallel effort moves forward, the insights gathered from this pilot project continue to inform the findings of this work.

The study identified several factors that impact early siting of the initial curbside EV chargers, this includes electrical power capacity and availability, existing EV ownership, conflicts and trade-offs within the multimodal transportation system. Additionally, curbside charging has increased importance in areas with high numbers of multifamily buildings that lack their own on-site parking for private charging stations and are not conveniently situated near publicly accessible charging stations in SFMTA and other off-street garages and lots. (See Figure 2)

Key recommendations include:

- By December 2025, the City needs to develop a Curbside EV Permitting process. This effort must identify clear roles, including a lead agency responsible for coordinating and implementing the legislative changes to support a streamlined EV charger permitting process with key approvals and a partnership model and roles identified. It is recommended that one of the agencies with relevant authority in this process take on this lead role in collaboration with key partner agencies.
- The City should clarify the role of public funding in supporting privately owned and operated, publicly available on-street curbside charging infrastructure and identifies four business, ownership and governance models for consideration by the city's elected leaders.
- The study identifies key considerations for identifying where early public funding investments should be focused in order to ensure that the benefits of electric vehicles are maximized for the public, both for people who drive EVs and need charging opportunities and the communities who will benefit from reduced tailpipe emissions generated by EVs.

Developing a network requires considerations to generate comprehensive solutions

It may look like just a box with a cord, but the path to successfully installing each electric vehicle charging station requires deep consideration to ensure that the station works well within our transportation system, our communities and for people who need to charge their vehicles.

When updated, a successful San Francisco EV curbside charging network will be located where it's most-needed based on both vehicle need and availability of off-street options, it will have received local community input to ensure that city efforts are equitably meeting each communities transportation needs and will be connected to an electric grid that has capacity to support it.

With all city departments working together with a common understanding and commitment to meeting this challenge, San Francisco will continue to be a leader in adoption of electric vehicles powered by renewable energy!

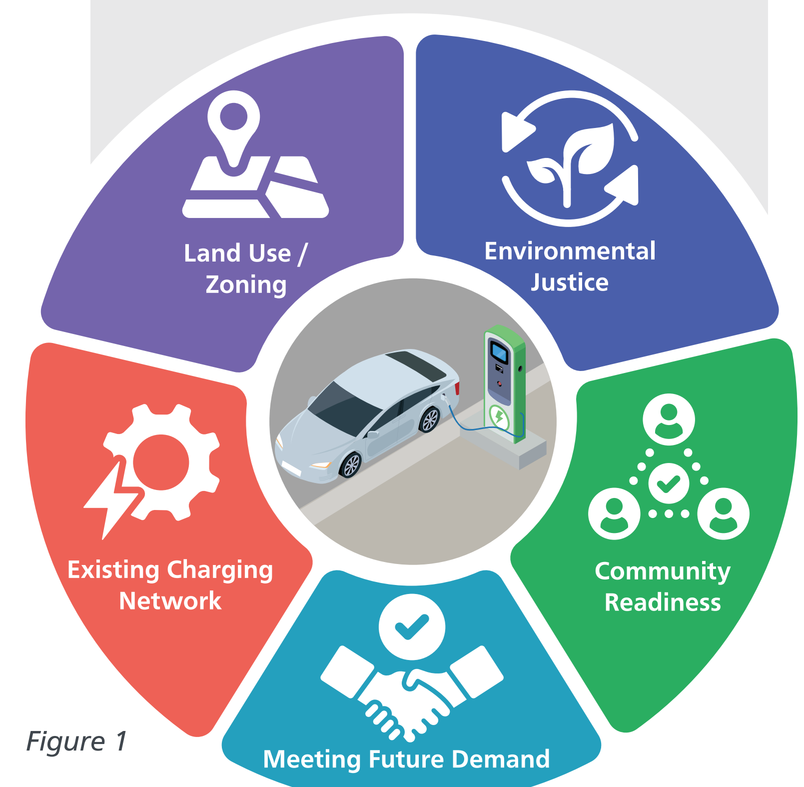


Figure 1

Introduction

San Francisco's transportation sector generates nearly half of the city's greenhouse gas emissions from private cars and trucks, which drives a rapidly changing climate system and creates health burdens upon local communities. The impacts of a rapidly changing climate system include rising temperatures, sea level rise, and extreme weather events, which are disrupting and damaging critical infrastructure, health, and property and contributes to poor air quality, disproportionately affecting communities of color, low-income communities, seniors, and people with disabilities. The city's 2021 Climate Action Plan outlines ambitious goals to rapidly reduce emissions and achieve net-zero greenhouse gas emissions by 2040 while recognizing the critical role of the city's Transit-First policy. Specifically, the plan calls for 80% of trips to use low-carbon modes such as biking, walking, and transit by 2030, vehicle electrification will increase to at least 25% of all registered private vehicles by 2030 and to 100% by 2040. Despite successfully reducing emissions from the transport sector by 29% since 1990, San Francisco must strategically utilize its full suite of policy levers and tools to reach its ambitious goals. This includes exploring how it manages the curb and public right of way, to rapidly reduce emissions and ensure a just transition to a transportation sector that prioritizes transit, biking and walking and, where necessary, private-vehicle trips are increasingly fueled by the city's renewable energy grid.

In order to address early commercial market volatility and constraints for privately owned and operated EV chargers, it will be important to create bridge solutions such as curbside charging. This could include publicly funded curbside charging stations which can help to ease the transition to a transportation sector that is increasingly fueled by renewable electricity. These solutions are already needed today as many residents do not currently have off-street parking spaces which are typically used to charge electric vehicles.

The 2021 Climate Action Plan contains a series of strategies and actions that provide a framework to reduce emissions from the transportation sector. One of the strategies aims to accelerate the adoption of zero-emissions vehicles (ZEVs) and other electric mobility options. Action 7.2 calls for the expansion of publicly available electric vehicle (EV) charging across the city that is financially and geographically accessible to low-income households and renters. Action 7.2 further states that by 2022, staff should complete an evaluation framework to develop curbside charging pilots.

This study is responsive to action 7.2 as it evaluates the feasibility of a curbside charging pilot program and recommends steps for moving forward with implementing a curbside charging pilot program.

Background Studies: City staff conducted two technical studies and administered a community survey that helped to advance staff's understanding of the supply and demand of electric vehicle infrastructure while also gathering community feedback.

- In 2020, staff from the San Francisco Environment Department and SFMTA partnered with staff from the International Council on Clean Transportation (ICCT) to quantify the number, type, and distribution of charging infrastructure needed to support rapid EV uptake to meet the city's goal to have 100% of new car sales be EVs by 2030. The analysis found that a local network of 1,760 public chargers, 3,369 shared workplace chargers, and 80,000 home chargers are needed by 2030 to support expected EV adoption. The report found widespread access to overnight home charging, including at homes, multifamily buildings, curbside, and other near-home locations, is critical to addressing public charging demand in the years ahead.
- In 2021, SFE and SFMTA received funding from C40 to develop a public survey to research the challenges and opportunities for enabling curbside access to EV charging in San Francisco. FM3 Research, the selected survey implementer, administered the survey to five priority ZIP codes that were selected based on estimated curbside charging needs and neighborhoods with multifamily housing: Mission/Bernal (94110), Castro/Duboce/Dolores/Noe (94114), Inner Richmond (94118), Outer Richmond (94121) and Haight/Cole Valley (94117). Through this public opinion survey of 435 residents, staff discovered that 66% of respondents supported installing curbside charging in their neighborhood. Furthermore, survey respondents would be more likely to favor curbside charging stations if they can be reserved, private charging station owners pay the City to use the space, and if only EVs are allowed to use those spaces.
- In 2023, city staff worked with ICCT to conduct a citywide EV charging cost-benefit analysis that identified the costs and benefits of EV charging by charging type to help determine the financial feasibility of establishing public charging networks. Building a citywide network of electric vehicle chargers requires substantial financial investment. Key findings from this study are that most of the costs to build a charging network are related to improving access to the energy grid and that Direct Current (DC) Fast Chargers are more costly to install due to their energy requirements and that it is possible to establish charging stations that generate revenue. This finding is validated by the fact that the SFMTA generates approx. $260-300K/year in revenue from its off-street charging network.

Policy Context: Transportation, Land Use, and Energy

This feasibility study aligns with the 2021 Climate Action Plan and Chapter 9 of the Environment Code and should seek alignment with a range of local, regional, state, and federal transportation, land use, and energy policies, codes, plans and regulations including those listed below.

- **Federal:** The US Departments of Treasury, Transportation, and Energy had been making making significant investments in EV infrastructure, including new investments across programs to increase the reliability and resilience of publicly accessible chargers, advance EV technologies, and support workforce development for EV charging deployment and maintenance. For example, the 2021 passage of the Infrastructure Investment and Jobs Act contains a suite of electric vehicle incentives and investments.
- **State:** California Air Resource Board (CARB) Advanced Clean Cars II regulation was passed in 2022 and requires all new passenger cars, trucks, and SUVs sold in California to be zero-emission vehicles by 2035. CARB has a suite of other policies, regulations, and programs, such as the Clean Miles Standard, Low Carbon Fuels Standard, and Advanced Clean Fleets regulations, which drive the conversion of the transportation sector in California to be increasingly fueled by renewable energy.
- **AB 2427** which requires local agencies to, among other things, develop a curbside permitting checklist by Jan 1 2027 for charging station within the public right-of-way. As part of that process, this bill would require local agencies to consider the **Electric Vehicle Charging Station Permitting Guidebook** from the Governor's Office of Business and Economic Development.
- **Local:** The San Francisco **Transit-First Policy** was adopted in 1973. The policy is a critical driver in San Francisco's transportation infrastructure and planning decisions. The policy prioritizes the efficient movement of people and goods, focusing on transit, walking, and biking instead of private automobiles. The Transit-First Policy prioritizes an equitable and efficient transportation system, clean air, safe streets, and a more robust economy.
- A basic assumption of the **Transportation Element** of the General Plan is that a desirable living environment and a prosperous business environment cannot be maintained if streets are congested with automobiles. The Elements states that "a balance must be restored to the city's transportation system, and various methods must be used to control and reshape the impact of automobiles on the city. These include improving and promoting public transit, ridesharing, bicycling and walking as alternatives to the single-occupant automobile". Specifically, Policy 2.2 aims to reduce pollution, noise and energy consumption and promotes the use of these alternatives above private automobile uses.
- San Francisco is a dense city, and with the recent adoption of the General Plan's **Housing Element**, additional housing will be developed, but some of that housing stock will not include parking for residents and a lot of existing multifamily housing does not have garages or charging infrastructure. Many residents, including those in affordable housing which almost never includes onsite parking, may require access to their automobiles to reach jobs, healthcare, and schools.
- The **San Francisco Electric Vehicle Ready Ordinance** took effect January 1, 2018. The Green Building Code (GBC) applies to new building construction and existing buildings with major alterations in San Francisco. The purpose of the GBC is to prepare San Francisco's built environment for widespread EV adoption by providing access to charging to its residents and visitors in off street parking.
- The City's **Curb Management Strategy** is a policy document that establishes priorities for the management of San Francisco's curb space and recommends policies and tools the SFMTA will consider utilizing as it manages the curb.
- In June of 2024, the Board of Supervisors passed Resolution No. 326-24 affirming support for this **Curbside EV Charging Feasibility Study**. The resolution also requests that these agencies deliver a report outlining recommendations, cost estimates, and funding strategies for a pilot program.
- The SFMTA Board of Directors adopted a resolution in May 2024 **(Resolution No. 240521-052)** that allows the SFMTA to designate curbside parking spaces as "electric charging only" and establishes an infraction and fine for parking a vehicle that is not connected to a charger or is obstructing access to the parking space.
- **Proposition A and the Transportation Code**, passed by voters in 2007, gave the Municipal Transportation Agency Board of Directors legislative authority to enact any parking and traffic regulations that are not preempted by state law or reserved to the Board of Supervisors. Pursuant to the authority granted to it by Proposition A, the Municipal Transportation Agency Board of Directors enacted Division II of the Transportation Code on July 1, 2008. Together, Divisions I and II make up the San Francisco Transportation Code which contains relevant parking and related regulations which are germane to curbside management.
- **SF Transportation Code Section 201** specifies that the SFMTA Board of Directors are empowered to designate on-street vehicle electric charging parking spaces. TC Section 301 declares a fine for parking a vehicle in an on-street vehicle electric charging parking space unless the vehicle is actively charging.
- **California Vehicle Code Section 22511** empowers a local authority to designate parking spaces on a public street under its jurisdiction for the exclusive purpose of charging and parking a vehicle that is connected for electric charging purposes.
- **California Vehicle Code Section 22511.1** establishes an infraction for parking any vehicle in a designated "electric charging only" parking space unless the vehicle is connected for electric charging purposes or for obstructing, blocking, or otherwise barring access to such parking spaces.
- **Better Streets Plan and Policy:** The Better Streets Plan and Policy creates a unified set of standards, guidelines, and implementation strategies to govern how the City designs, builds, and maintains its pedestrian environment and the public right of way.

Curbside EV Charging Program Scope & Vision

The Program consists of two phases, Phase A, this feasibility study with recommendations, and Phase B, which is the implementation phase that installs, maintains and operates a curbside pilot network. The Curbside EV Charging Program's vision is to create an equitable, accessible, and reliable curbside EV charging network, primarily serving residents in multifamily buildings that lack off-street parking options who park on the street overnight. The vision prioritizes robust and inclusive community engagement and creates an additional mechanism for San Francisco to rapidly reduce emissions from the transportation sector, while also acknowledging the importance of the "Transit First" policy which prioritizes space and energy efficient modes such as transit, bicycling and walking over energy and space intensive automobiles.

Phase A – Curbside EV Charging Feasibility Study

Phase A of the Curbside EV Charging Program comprises a technical feasibility study and stakeholder and industry engagement to gather feedback from the community, stakeholders and industry while determining if it is feasible to install, operate and maintain a public curbside charging network. Throughout Phase A, the study team comprised of SFMTA and SF Environment Department worked with the consulting firm Arup and engaged partner agencies, including the San Francisco Public Utilities Commission (SFPUC), San Francisco County Transportation Authority (SFCTA), San Francisco Public Works (Public Works), and the Planning Department.

Elements of Phase A include the following:

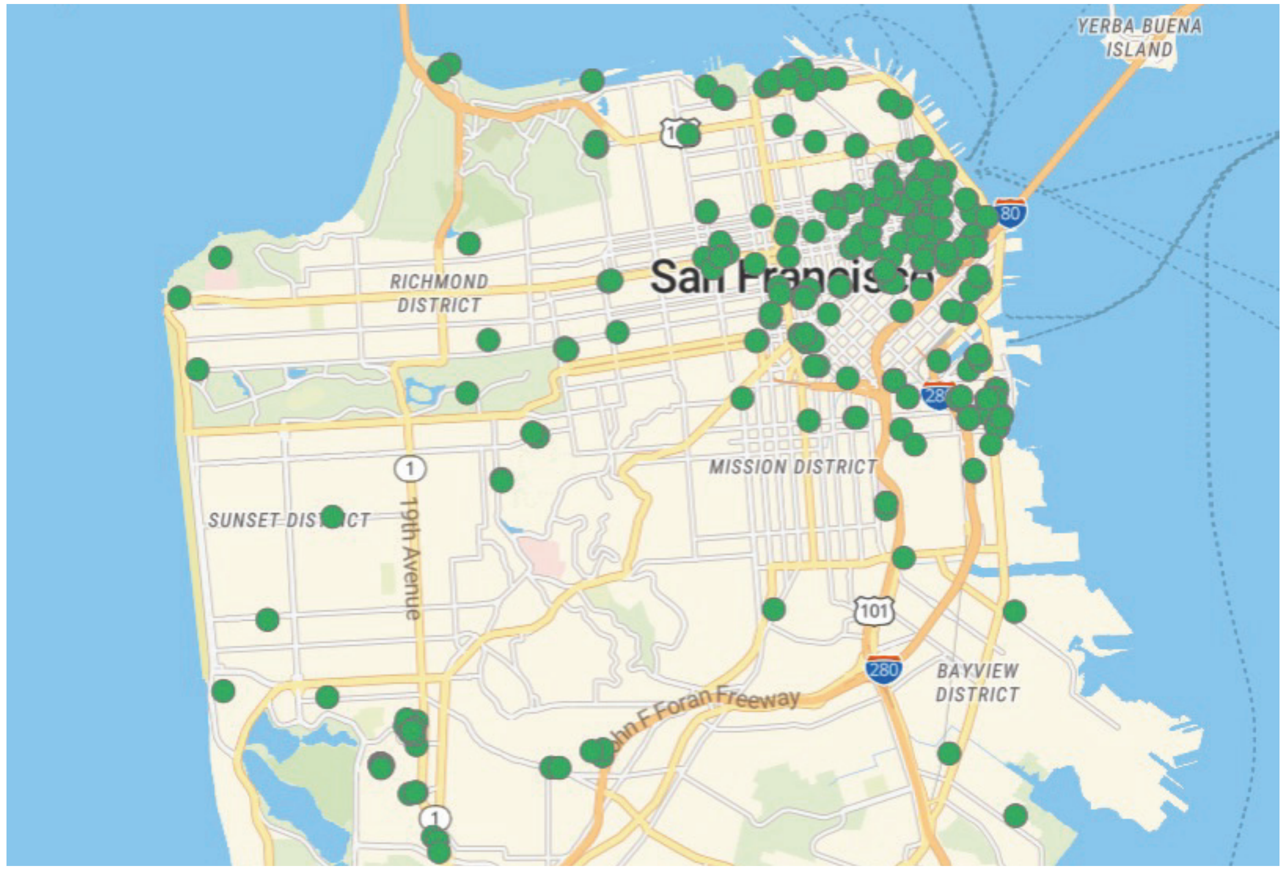
- Synthesis of policy context and existing conditions;
- Review of charging technology and standards;
- Review of jurisdiction, authority and regulatory considerations;
- Curb management and multimodal considerations;
- Review of accessibility requirements;
- An assessment of grid capacity and energy requirements;
- A site suitability analysis using a GIS mapping tool;
- A financial feasibility assessment and cost-benefit analysis;
- Review of governance, business and ownership models;
- Equity considerations;
- Literature review and case studies;
- Summary of stakeholder and industry engagement;
- Summary of recommendations, cost estimates and funding strategies.

Phase B – Pilot Implementation

Phase B is the pilot implementation phase and entails installing, maintaining and operating a small curbside network that leverages any future investment in public charging infrastructure while developing process improvements for streamlining approvals and permitting. Implementation of a pilot was initiated through the Mayor's Curbside Electric Vehicle Charging Pilot launched in 2024 with the first chargers set to be in the ground in 2025. The pilot is the City's first step toward expanding access to curbside electric vehicle charging infrastructure. By advancing proposals from three leading electric vehicle charging companies, San Francisco will move closer to achieving its climate action goals and supporting equitable adoption of EVs for residents without off-street parking. The current pilot does not require public capital as all funds to deliver the charging stations are brought by the private vendors who seek permits and approvals from relevant agencies such as Public Works. Many of the proposed chargers advanced by vendors may also leverage existing grid capacity which reduce costs and will likely speed the delivery of charging stations as it will not trigger grid related improvements which can be time and capital intensive. This first phase has highlighted the complexity of the City's permitting process, local siting considerations, grid constraints and opportunities and demand from private vendors with diverse business models. As such, it informs the recommendations found in this report and should inform how future phases of the pilot are scoped and implemented.

Over the summer of 2024, two competitive proposals aimed at funding future phases of the curbside pilot as well as off-street charging deployment were submitted in response to open federal grant opportunities. In January 2025, the San Francisco Environment Department and partners received notification that the two grants were awarded, totaling approximately $16M in funding. As of April 2025, San Francisco Environment Department is awaiting further information from the Departments of Energy and Transportation regarding the status of these awards.

Existing Conditions: San Francisco's EV Charging Network



= location of a public ev charger

Figure 2: Map of public charging stations in San Francisco as of late 2024.

San Francisco continues to be a leader in the adoption of EVs. In 2023, 9% of all registered passenger vehicles in San Francisco were battery EVs and plug-in hybrids, and EVs and plug-in hybrids represented over 37% of the city's vehicle sales. San Francisco's commitment to expanding its EV charging infrastructure is a critical component of its strategy to meet the city's 2030 and 2040 climate goals.

As of Jan 2025, 14 private EV companies operate charging infrastructure in San Francisco's public charging network, with ChargePoint leading in public Level 2 charging stations and Tesla leading in public DC fast charging station. San Francisco has approximately 1096 public chargers located on both private and public property. The chargers on private property, which are managed and owned by private vendors such as EVgo and ChargePoint can be found at grocery stores, retail shopping centers and private parking facilities.

This includes 920 public Level 2 chargers and 176 public DC fast chargers. The SFMTA manages 55 dual-port Level 2 chargers in municipally owned public parking garages.

These chargers are leased from ChargePoint, which has contracts with the SFMTA garage operators. SFMTA and ChargePoint have a revenue sharing agreement, wherein ChargePoint receives approximately 10% of the revenue generated from charging. In 2024, the network generated approximately $260-300K in revenue which does not include the parking fees which are generated when customers enter the parking facilities. According to 2024 data provided by ChargePoint and the SFMTA Parking team, the off-street network had an average utilization rate of 50% with some stations having a 70% utilization rate which reflects the high demand in certain locations for charging stations.

Parking enforcement is not currently needed within SFMTA's off-street parking garages to ensure there is adequate turnover and access to the chargers. Currently, most public chargers are in the city's northeast section in the downtown/commercial district which is depicted in Figure 2.

Current projections indicate there is a need for approximately 1760 publicly-accessible charging stations by 2030. San Francisco already has 1096 installed leaving a gap of approximately 600 to be installed in the next five years.

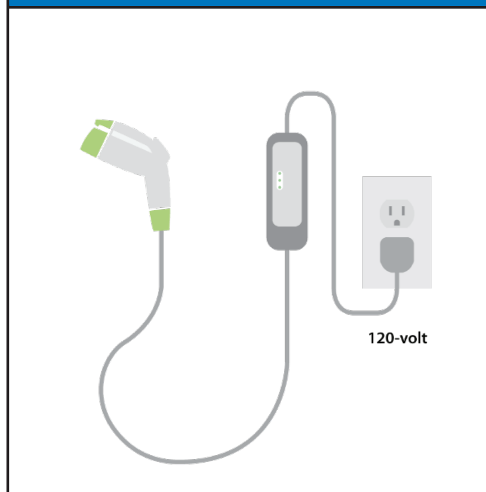
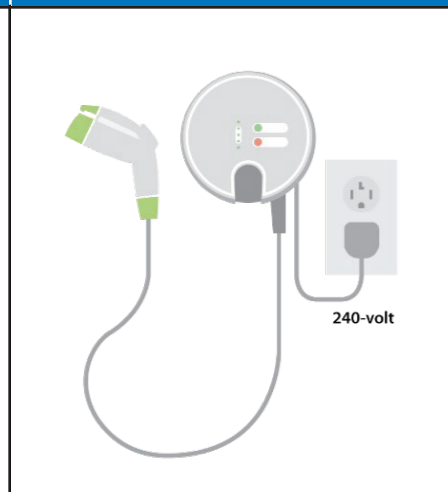
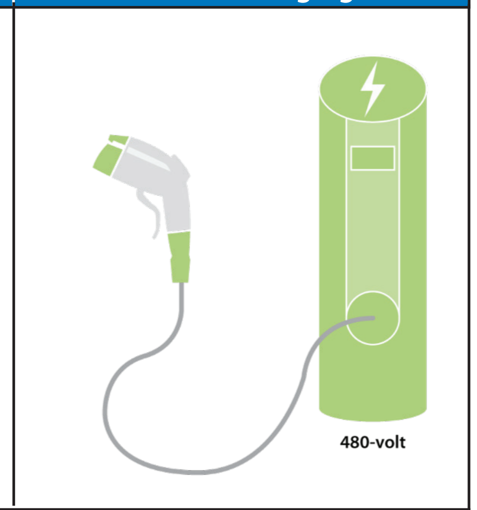
Additionally, the San Francisco County Transportation Authority (SFCTA) has provided Transportation Fund for Clean Air (TFCA) funds for numerous EV initiatives.

For example, SFCTA provided $350,000 to EVgo for public EV fast chargers in areas with limited charging infrastructure and $34,628 for EV chargers at faith-based locations in partnership with California Interfaith Power & Light. In its administration of TFCA and other funds for EV charging projects, SFCTA has identified a number of barriers to implementation for off-street projects. In past EV charger initiatives targeting existing mixed-use buildings, SFCTA notes that the infrastructure upgrades required for the chargers (in particular DC fast chargers) and the desire of some parking users to keep parking spaces open to non-EVs can make it difficult for building owners to move forward with installation. The use of TFCA funds also generally requires that EV chargers are publicly accessible, which has limited opportunities for installation of chargers within mixed-use buildings and other sites where public access cannot be provided at all times.

Electric Vehicle Charging Technology and Standards

There are three primary types of EV supply equipment (EVSE), Level 1, Level 2 and Level 3. Each type has different energy requirements, specific circuit voltage requirements, and various vehicle charging times which are captured in Table 1. Standards for charging infrastructure are overseen by the California Energy Commission and contain requirements such as payment methods, monitoring and labelling requirements. Senate Bill 123 harmonizes requirements between the Electric Vehicle Supply Equipment (EVSE) Standards Regulation and the federal funding requirements in the National Electric Vehicle Infrastructure (NEVI) Program established in 2022. SB 123 grants the California Energy Commission (CEC) authority to develop a new regulation that will supersede the current California Air Resource Board (CARB) adopted rule. Final regulatory language for the new Electric Vehicle Supply Equipment (EVSE) Standards can be found on CARB's webpage. Standardization within this emerging industry should help with the deployment of EVSE as there have been instances of emerging technology not ready to be scaled widely within complex urban areas such as San Francisco.

Table 1

Level 1	Level 2	Level 3 DC Fast Charging
		
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	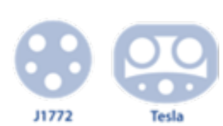	
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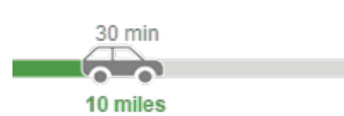
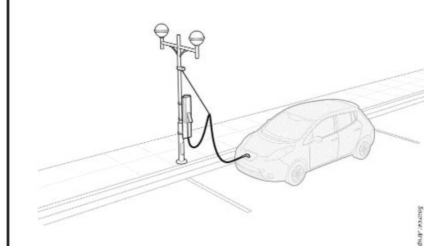
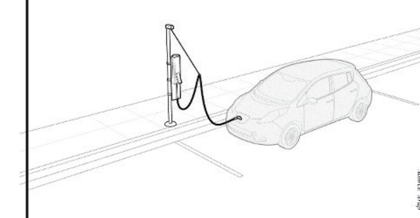
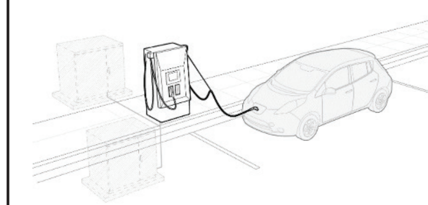
		

Level 1	Level 2	Level 3 DC Fast Charging
Amperage		
12 to 16 Amps	12 to 80 Amps (Typ. 32A)	to 250 Amps (Typ. 130A)
Wattage		
1.4 to 1.9 kW	2.5 to 19.2 kW (Typ. 7kW)	50 to 175 kW (Typ. 100kW)
Implementation		
More suitable for residential areas where overnight charging is available as turnover is slow.	More suitable for residential / some commercial areas where there is medium demand as turnover tends to happen every 4-5 hours.	More suitable for commercial/retail areas where there is high demand. Turnover is fast (less than an hour).

Curbside charging technology is primarily composed of Level 2 and Level 3 chargers which can be either standalone or leverage existing infrastructure such as light poles. Table 2 contains relevant examples.

Table 2

Level 2 EVSE on existing light poles	Level 2 standalone EVSE	Level 3 standalone EVSE
		
This technology may reduce the cost per unit by leveraging existing infrastructure that can mitigate the need for additional groundwork but may be challenging to deploy due to a suite of grid related constraints such as a lack of space within existing utility poles and a lack of grid capacity.	This technology requires installing a new pedestal, trenching to the pole from an adjacent transformer.	This technology may not be appropriate for projects within the right-of-way due to energy requirements and the associated high cost of upgrading the grid.

Note: Deployment with Level 1 chargers has not been analyzed as part of this study. This, however, should not preclude their deployment as the pilot advances to Phase B on a case-by-case basis as they can serve a role in a network especially in areas where there are constraints on grid capacity.

Key Findings: Level 2 charging stations are ideal for curbside charging needs and are best suited for serving residents in multifamily buildings, the target population for the City's curbside charging program. The study identified constraints, both technical and financial, associated with installing Level 2 pole-mount EVSE on existing light poles and utility poles.

Recommendations: Standalone Level 2 chargers should be prioritized for deployment within the pilot implementation phase. Despite the challenges associated with Level 2 pole-mount EVSE their use in a pilot network should continue to be explored with SFPUC and PG&E which could minimize cost per unit of EVSE installations. One potential solution is to design and engineer new light poles and curbside infrastructure that allows for charging so that when new utility poles are installed they can more readily accommodate charging.

Jurisdiction, Authority and Permitting

There are many agencies and utilities that have jurisdiction and authority within the right of way that are required for installing, maintaining, and operating a public serving charging network and who have jurisdiction over parking and curb management which are captured in Tables 3, 4 and 5. A suite of codes also apply within the public right of way such as the Planning and Transportation Code.

Table 3

Agency	Authority and Jurisdiction spans:	Examples of Permits and Legislation:
Board of Supervisors	Approves, modifies or rejects a Major Encroachment Permit, legislation related to right-of-way use, and potentially public funding proposals	Major Encroachment Permit. Changes to permitting legislation and budgeting.
Board of Directors of the San Francisco Municipal Transportation Agency	Parking enforcement, parking and curb management legislation, compliance with accessibility and ADA requirements	Legislates changes to curb use. Additional public hearings may be required.
San Francisco County Transportation Authority	Funds elements of the transport network.	

Table 4

Agency	Authority and Jurisdiction spans:	Examples of Permits and Legislation:
San Francisco Public Works	Permitting infrastructure in the public right of way and ensuring that right of way does not have hazards such as unpermitted ev charging cables. Public Works will also review appropriate path of travel clearances, and grade changes within the right-of-way.	Excavation Permit, Minor or Major Encroachment Permit, Vault Permit
San Francisco Department of Building Inspection	Permits and inspects electrical infrastructure	Electrical Permit
San Francisco Public Utilities Commission	Serves as local municipal utility, manages and provides energy and connects chargers to the grid	Electric Service Verification
Pacific Gas & Electric (PG&E)	Serves as private utility, manages and provides energy and connects chargers to the grid	Electric Service Verification
San Francisco Fire Department	Curb access between street and sidewalks for emergency response	a part of project approvals via Transportation Advisory Staff Committee (TASC)
San Francisco Planning Department	Conducts environmental review (CEQA) and manages city land-use / zoning rules.	Environmental Planning division reviews projects for potential environmental impacts on the City of San Francisco and its residents. Reviews are conducted pursuant to the California Environmental Quality Act (CEQA) and Chapter 31 of the San Francisco Administrative Code, which provides guidelines for implementing the CEQA process.

Table 5

Agency	Authority and Jurisdiction spans:
San Francisco Environment Department	Leads development and implementation of climate and energy related plans, policies including Climate Action Plan, Chapter 9 of the Environment Code and often secures grants.

Implementing curbside EV charging projects requires navigating a complex permitting and legislative processes, that involves multiple agencies. Currently, there are two permitting and legislative "pathways" for curbside EV chargers: the "standard" permitting process and a temporary process supporting the Mayor's Curbside Electric Vehicle Charging Pilot permitting pathway.

Standard permitting pathway

Permitting and legislating curbside EV chargers in San Francisco requires approvals and actions from multiple departments and is time intensive. The estimated timeline for delivering projects is between 12 to 18 months to secure all necessary permits and approvals. This extended timeline is a barrier to accelerating EV adoption, as it limits how quickly new chargers can be deployed to meet growing demand and rapidly reduce emission. Table 1 includes examples of the types of permits and legislative approvals generally needed to establish a curbside EV charger. This pathway assumes projects would need to secure permits such as, Encroachment (minor or major) Permit, General Excavation Permit and an Electrical Permit in addition to securing proof of having new electric service or existing capacity through SFPUC or PG&E. If a proposed project draws power from a fronting property it may trigger the need for a private transformer which would require securing a vault permit from Public Works. Furthermore, unless the property owner applies for the encroachment permit it would be a major encroachment requiring Board of Supervisor's approval. Environmental review will also need to occur to ensure compliance with California Environmental Quality Act (CEQA). All discretionary actions taken by the City are subject to CEQA review unless they are considered "not a project" or are otherwise exempted. Exempted projects must undergo some level of review to make that conclusion and document the determination. Permits for EV charging stations have two potential environmental review paths, either ministerial or discretionary. Finally, this "pathway" includes public notices, hearings and review with relevant bodies that includes agencies such as the San Francisco Fire Department, and concludes with the conversion of a parking space to a curbside charging parking space which is legislated by the Board of Directors of the SFMTA.

Mayor's Electric Vehicle Charging Pilot permitting pathway

In summer of 2024, Mayor Breed launched the Mayor's Curbside Electric Vehicle Charging Pilot that included a modified permitting pathway that uses the City's Emerging Technology Permit to avoid some of the traditional permit approaches while also leveraging the novel aspect of curbside charging. Through this pilot, EV charging providers can propose installing and operating a curbside charging project across San Francisco. The City will review proposals, and if proposals are complete and meet preliminary requirements, applicants can secure the required permits, including an Emerging Technology Permit (Public Works), General Excavation Permit (Public Works), and Electrical Permit (DBI), as well as proof of new electric service or existing capacity through SFPUC or PG&E.

As noted above, environmental review will also need to occur to ensure compliance with California Environmental Quality Act (CEQA). Proposed projects also require public hearings and noticing the public to ensure the public is informed of the proposed charging station. The final step requires legislation at the Board of Directors of the SFMTA which has the authority to convert parking spaces to an electric vehicle-only space. This temporary process is not considered a long-term solution, but has been helpful in identifying needed process changes that could create a more efficient permitting process going forward.

Code Compliance and Review: Other relevant advisory bodies, such as the Transportation Advisory Safety Committee (TASC) provide a forum for cross departmental review on specific proposed changes to the public right-of-way. These bodies can be engaged to ensure compliance with the City's Better Streets Plan and relevant sections of the Planning, Transportation, Fire and Administrative Code.

Key Findings: the permitting process is complex and requires multiple departments to issue permits and approvals which could delay the permitting and delivering a curbside charging network. Furthermore, the required permits do not contemplate the nuances and various business models associated with deployment of charging infrastructure in the public right of way.

There is no "lead" agency which is responsible for managing the permitting and approvals process.

Recommendations: Consider advancing legislation that streamlines permitting and review processes, clarifies agency roles and aligns relevant codes and legislation. Improve the efficiency of the review and permitting process and expedite the permitting and legislative path for future phases of the curbside program. Examples of expedited permitting includes the City's "over the counter" permit process. This report recommends that one of the agencies with relevant jurisdiction and authority, assume the "lead" role in streamlining the permitting process. The roles for other key departments, such as the SFPUC, should be clarified to support the establishment and maintenance of a charging network based on their respective jurisdiction, authority and capacity.

Summary of Curb Management and Multimodal Considerations

Managing the curb is essential in creating a safe, efficient multimodal transportation system that aligns with relevant codes, regulations, policies and plans such as the Transportation Code, Transit-First and Vision Zero policies and the SFMTA's Curb Management Strategy. San Francisco has high demand for curb space and several competing uses that must be considered in establishing a curbside EV charging pilot. The 2020 SFMTA Curb Management Strategy identifies five critical functions for the curb:

- Access for people (e.g., pick-up/drop-off zones and bus stops)
- Access for goods (e.g., loading zones)
- Public space and services (e.g., parklets)
- Storage for vehicles (e.g., parking, driveways, bike parking)
- Movement (e.g., transit lanes, bike lanes)

Curb functions are prioritized based on land use and transportation conditions along the street, with movement as the top priority for all land uses and access for people as the second highest priority for most land uses. As of 2020, 90% of curb space was allocated to parking, 4% to movement, 2% to access for goods, 2% to public space and services, and 1% to access for people.

The curb and adjacent sidewalk area contain an array of existing infrastructure and uses that must be considered and navigated as locations are evaluated for siting charging stations. This includes fire hydrants, sewer lines, curb ramps, parking meters, water meters, mailboxes, bus shelters, utility poles, buried infrastructure, street signs, street trees, vaults and basements used by commercial property owners.

The curb and public right of way are dynamic elements of city's public realm and are subject to both physical and legislative change and serve an important role for businesses and in creating an accessible transportation system.

One example that reflects that dynamic nature of the curb includes the recent passage of AB 413 ("Daylighting Law"), which went into effect in 2024 and states that vehicles cannot park within 20 feet of the approach of any marked or unmarked crosswalk. After AB 413 went into effect, pressure for access to the curb increased. The curb is also used for loading purposes which is important for local merchants and businesses who need access to goods and plays an important role in creating an accessible transportation system for all residents and visitors. Blue zones will continue to increase as they provide key access to public destinations for many people with disabilities. These competing demands upon the finite curb resources will continue to ensure that siting of EV charging stations will be a complicated and nuanced process.

Future planning and siting will need to consider the local multimodal conditions to ensure that charging station siting does not lead to congestion, delay or conflict with modes such as transit, bicycling or paratransit service or create hazardous conditions. For example, it will be important to avoid situations wherein customers may double park their cars as they wait for a spot to charge which could impact transit and bicyclists and motorists. This scenario will require the use of Parking Control Officers to enforce existing regulations. Staff should continue to consult with bike, transit, and paratransit colleagues as the charging network is planned and designed and should explore opportunities to co-locate charging stations with other mobility services as long as they don't create hazards or conflicts with other modes. Furthermore, parking protected bike lanes, wherein parked vehicles are moved away from the curb to create a bike lane at the curb, will not be suitable for curbside charging due to need to stretch a charging cord from the curb and because ADA access requires the buffer zones to serve as accessibility areas.

As the curbside network is advanced it will need to avoid placing chargers on curbs identified as future separated bike facilities, or with the awareness that access to the chargers may be eliminated when future projects are implemented on those corridors. Staff should also continue to monitor the design of electric vehicles to ensure siting of stations are aligned with the placement of charging ports on vehicles to reduce the need to drape cables across vehicles which could lead to safety hazards and obstacles.

Finally, creating reliable access to charging infrastructure at the curb will require a suite of mechanisms, including utilizing parking meter pricing, charging rates and enforcement to ensure turnover occurs for vehicles that have fully completed charging. For example, the price for the charging can be increased when a battery is fully charged, resulting in an increased likelihood that spaces will be vacated after completion of the charging-cycle and made available for the next vehicle needing to use the charger. The parking price and charging rate structure should also account for time of day and night and aim to incentive off peak usage when energy tends to be cheaper while avoiding having the rates significantly increase during the middle of the night which may discourage usage. The technology also exists to allow for reserving spaces and should be considered as deployment advances to reduce double parking and to nudge users from parking as opposed to charging their vehicles.

Parking enforcement is provided by the SFMTA Parking Control Officers who enforce parking regulations such as general meter enforcement, color curbs, commute zones, double parking and residential permit parking. Parking Control Officer's primary focus is on enforcement of parking regulations in priority areas of the city and therefore they may not always have the resources to ensure that vehicles are actively charging and using the curb-space as intended. It should be noted that if restricting access to commercial vehicles and fleets is of interest, Transportation Network Companies (TNC's), such as Lyft and Uber, do not rely on a fleet to deliver their mobility services and the vehicles are privately owned which means that it will be particularly challenging to identify when these vehicles are in service in an attempt to maintain chargers for personal vehicles only.

This is further complicated by the lack of authority that local entities such as San Francisco have over TNC's and other mobility services including autonomous vehicles (AV's). Finally, given that AV's are currently managed as fleets, it is our assumption that these fleets will likely charge at their fleet facilities and not rely on curbside charging stations. In summary, enforcement of curbside parking spaces should utilize redundant mechanisms such as pricing and parking enforcement which can help to ensure that vehicles leave curbside spaces when they are done charging which will help create a reliable network.

Key Findings: The curb is an important and dynamic "tool" in managing the circulation system and is in high demand especially in commercial areas. Additionally, there are a suite of plans, policies and regulations that need to be considered and aligned with as curbside charging planning advances. There are many modes using the right of way and curb, such as transit, that should not be impacted by cars who may be double parked and waiting to charge. Parking-meter pricing, the structuring of charging rates and parking enforcement are important mechanisms and tools that can help reduce conflict with other modes and ensure that there is reliable access to charging stations. Finally, curbside charging stations should be sited with an understanding that the uses of the curb and right of way continues to evolve and with an eye towards future changes within the public right of way so that charging infrastructure does not need to be relocated after installation.

Recommendations: Avoid siting charging stations, at least initially, along commercial corridors where the demand for curb space is already at a premium. Charging locations should consider local conditions such as curb ramps, fire hydrants, street trees, transit and signal related infrastructure such as signal boxes and avoid conflict with other modes such as bicycles, transit and paratransit vehicles, including future transportation network expansions. Future planning should aim to align with important transportation policies such as the Transit First and Vision Zero policies to ensure that safe conditions are prioritized for all residents and visitors. Utilize and synchronize the array of tools including Parking Control Officers, pricing for metered-spaces, charging rate structure and technology to help ensure that there is reliable access to charging stations.

Assessment of Accessibility Requirements

EV chargers installed in the public right-of-way have unique accessibility and design issues due to space constraints that may make installing and accessing chargers challenging for individuals that may have mobility challenges. When siting and designing curbside EV charging stations, EV charging stations should be accessible and should aim to comply with the Americans with Disabilities Act (ADA) requirements and the U.S. Access Board's Design Recommendations for Accessible Electric Vehicle Charging Stations, a document providing technical assistance in the design and construction of accessible EV charging stations. The minimum scoping and technical requirements include, but are not limited to:

- That charger be oriented facing the sidewalk and placed as close to the edge of the curb face as possible and no farther than 10 inches away from the curb.
- Clear ground space for the forward approach and turning space for people using mobility devices.
- Have unobstructed side reach.
- Connectors and charging cables meet accessibility standards.
- Chargers should not be placed within the middle 50% of the sidewalk adjacent to the on-street parallel parking space because this design would obstruct entry to and exit from the vehicle.

Given San Francisco's topography, it is also essential to consider local conditions and avoid siting charging infrastructure in locations with a slope greater than 5%.

Beyond the physical access considerations, it is important to ensure that the user interface and payment system, or information and communication technology (ICT), adhere to the requirements of Section 508 of the Rehabilitation Act if the EV charging station is developed, procured, maintained or used by the federal government. Finally, as of early 2025, staff from SFMTA, Public Works, the Mayor's Office of Disability are collaborating on the development of accessibility requirements which will help to orient vendors to requirements for siting charger infrastructure which should help ensure that chargers are accessible.

Key Findings: Creating a curbside charging network that is accessible for all users regardless of their mobility challenges should be a priority and will help ensure consistency with local, state and federal laws and regulations such as the Americans with Disabilities Act (ADA).

Recommendation: Finalize the accessibility guidelines with city partners which will create a citywide understanding across the city of the requirements and ensure compliance with local, state and federal accessibility regulations.

Assessment of Grid Capacity & Energy Requirements

SFPUC and PG&E both serve as the power utilities and local grid managers in the City. The investor-owned utility PG&E owns and manages most of the local electric grid infrastructure. The municipal utility SFPUC has provided clean, safe, and reliable Hetch Hetchy hydropower to San Francisco for over 100 years. The SFPUC's public power serves various City services, including the airport, libraries, General Hospital, and the Muni transit system. Through the Hetch Hetchy hydropower and the clean energy SFPUC buys for CleanPowerSF, SFPUC currently generates and supplies about 75% of the electricity used in San Francisco.

Energization is the process of making electrical infrastructure operational and accessible to new customers. Given the need to access and deliver energy for a future curbside pilot, assessing the grid capacity is a crucial step in the development of a charging network. Arup used PG&E's publicly available load hosting capacity data to get a snapshot of existing energy availability throughout the city. Load hosting capacity indicates the maximum load the energy grid can handle without safety or reliability issues arising and is typically lowest during peak hours when there is more demand on the grid. The findings from their analysis were integrated into the site suitability analysis and indicate that there is adequate supply to meet projected demands. This information captures general capacity data which must be verified and assessed at a more detailed scale when a specific project is proposed.

SFPUC assisted in identifying potential areas for curbside EV installation on its network, including City-owned property, Treasure Island, and the Bay Corridor Transmission and Distribution line. Installations in redevelopment areas could facilitate cost savings, as EV infrastructure can be planned during the design or construction phase and avoid the need for new trenching and repaving. Level 2 chargers, unlike DC fast chargers, are typically not large consumers of energy and can often be installed using existing energy sources. However, depending on the grid capacity and energy demands of future projects, the grid may need to be improved to serve future charging needs. Much of the cost of charging projects are grid related as accessing and improving the grid require detailed design, engineering, trenching and possibly improving elements of the grid.

In other instances, existing grid capacity and connections serves as a source for energy needs which is how companies such as ItsElectric power their chargers. As noted earlier, there may be additional ways to reduce costs include leveraging existing infrastructure that are already energized such as utility poles. While this may be an opportunity, there are currently constraints such as a lack of energy and a lack of space with the poles for new cables to serve charging infrastructure. In order to determine whether it is reasonable or viable to leverage utility poles the SFPUC should conduct a feasibility assessment of existing utility poles in priority locations to determine if they can be leveraged to reduce costs and speed delivery of charging stations. Another approach to overcoming these barriers is to replace old utility poles with new ones that are better suited to serving multiple roles including charging. SFPUC Hetchy Power could serve future curbside chargers if they are located adjacent to municipal property or other sites served by the SFPUC. The SFPUC should continue to be a partner agency to help determine potential cost-effective approaches to energizing a future network.

Key steps to consider when initiating a project include the following:

- Coordinate with the utilities and determine the power requirements of a proposed project (ex: number of chargers and charger type such as Level 2);
- Make an initial determination of the local grid capacity and interconnection location that will serve the energy to the project;
- Submit application material with specific energy requirements to the utility which will help determine if there is grid capacity and will shed light on whether there are grid capacity constraints;
- Address any grid capacity constraints via capital improvements;
- Secure interconnection permit!

Key Findings: based on an initial assessment there is adequate grid capacity to supply a future pilot project within San Francisco.

Recommendations: continue to consult and coordinate with both utilities, PG&E and the SFPUC. Future planning should evaluate potential sites adjacent to municipal property and/or redevelopment areas to take advantage of potential cost savings in using the SFPUC's Hetch Hetchy power.

Conduct a feasibility assessment of existing utility poles and curbside infrastructure in priority locations to determine if they can be leveraged to reduce costs and speed delivery of charging stations.

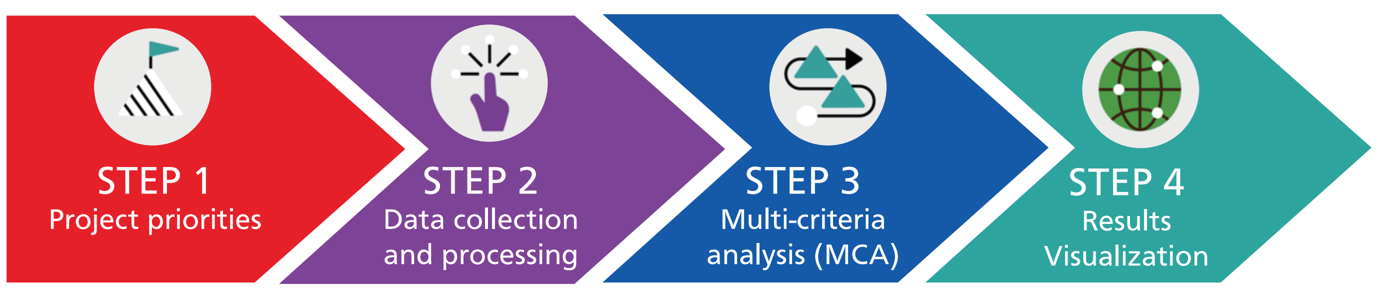
Site Suitability Analysis

Identifying suitable locations for a future charging network is a priority task within the feasibility study. Arup conducted a site suitability analysis using their proprietary Charge4All tool. The analysis had four steps:

1. Identify project priorities,
2. Collect and process data,
3. Conduct multi-criteria analysis,
4. Visualize results.

The Arup team facilitated a workshop with SFMTA and SFE staff to identify selection criteria to align with City goals and conducted a multi-criteria analysis that included the following data: current EV adoption and car ownership rates, curb use and average dwell time, socio-economic indicators, available grid capacity, land use, policies, mobility patterns, risk & resilience, and safety indicators. Staff also conducted a weighting exercise to assign weights to each of the criteria.

The baseline assumes that areas with metered parking, bike lanes, curbs within 20 feet of a crosswalk, and color curbs are incompatible with charging infrastructure and Phase B implementation. The analysis scored and aggregated the data based on the assigned weights for each criterion. Finally, Arup visualized the results of the analysis which identified areas with higher concentrations of suitable sites. The citywide hex-level map, see Figure 3, provides suitable locations for curbside EV charging across San Francisco. The findings indicate that all supervisorial districts have neighborhoods where siting would likely be feasible, with local conditions needing to be evaluated during the next phase of planning and siting. Future work should evaluate local and block level conditions such as street and sidewalk slope, grid capacity and interconnection points, and curb demand. Additional detail on site suitability analysis can be found in Appendix I.



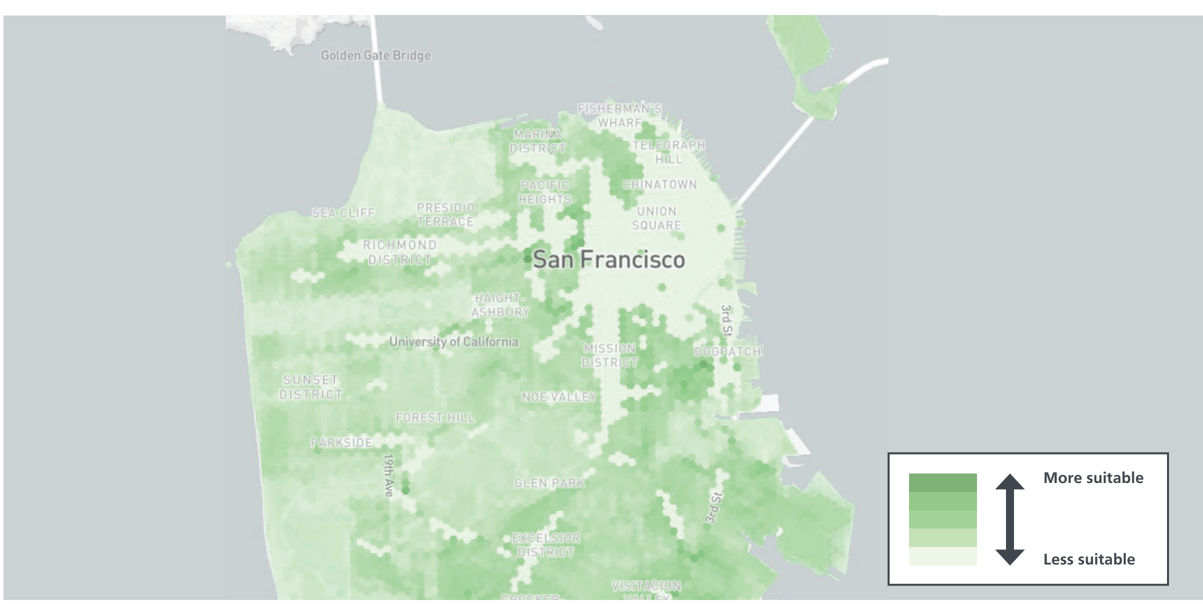


Figure 3

Table 6

Supervisorial District	Examples of neighborhoods with higher suitability for pilot implementation
1	Central and Outer Richmond
2	Marina and Lower Pacific Heights
3	Chinatown and North Beach
4	Parkside and Outer Parkside
5	Western Addition and North of the Panhandle
6	Mission Bay and South Beach
7	Balboa Terrace and Midtown Terrace
8	Duboce Triangle and Glen Park
9	Mission and Portola
10	Potrero Hill, Bayview, and Visitacion Valley
11	Mission Terrace, Outer Mission, and Excelsior

Financial Feasibility and Cost-Benefit Analysis

Operating a curbside EV charging network will establish a new business model within the public right of way. To ensure the viability of future projects, it is important to understand the financial considerations, risks and opportunities. This section provides a comprehensive financial analysis, examining capital and operational expenses, and estimating the revenue generation potential. The analysis is based on benchmarks from similar projects, internal databases, and widely recognized construction cost databases, including RSMeans.

Capital and Operational Cost Estimates

The analysis focuses on Level 2 chargers, which offer a balance between performance and cost. Capital costs include everything from the civil works (such as trenching and installing concrete pads) to the actual EV charging infrastructure itself. Using historical data, Arup estimated the average cost of installing one standalone charger to be approximately $41,000, though actual costs could vary significantly, from $23,000 to $57,000, depending on site-specific conditions and charging station specifications. Key assumptions include civil, electrical, and infrastructure related work, with significant variability expected based on local conditions and grid capacity, particularly for trenching and related civil and electrical interconnection costs. Exclusions from the estimate include transformers, land acquisition, and other site-specific factors, which may affect final costs once locations are confirmed.

In terms of operational costs, electricity is the largest expense, with average rates in San Francisco estimated at $0.31 per kilowatt-hour (kWh). Maintenance costs are generally low, estimated at $320 annually per charger, with some manufacturers incorporating these costs into their overall installation fees.

Table 7

Per-Charger Cost Estimates	
Direct Costs	
Civil Works (trenching, asphalt pavement, striping, mounting hardware, receptable post, concrete pad)	$7,000
Conduit and Feeders	$4,000
EV infrastructure	$9,000
Total Direct Cost	**$20,000**
Indirect costs	$4,000
Total Construction Cost	**$24,000**
Contractor’s contingency	$5,000
Soft costs	$5,000
Owner’s contingency	$7,000
Total Project Capital Cost	**$41,000**
Capital cost range: Low (-40%)	$23,000
Capital cost range: High (+50%)	$57,000
Operational Costs	
Operational and Maintenance costs (service fee) does not include CCSF staff time	$320

Cost-Benefit Analysis

A financial cost-benefit analysis was conducted to determine whether it is financially feasible to install, operate and maintain a network of curbside chargers. The analysis explored when revenue generation would exceed expenses associated for the installation and operation of a Level 2 charger in order to achieve a cost-neutral pilot or revenue generating business model. Capital costs were benchmarked against comparable projects, excluding site-specific factors such as taxes or environmental conditions. The cost-neutral analysis assumed typical costs to the customer, with additional funding opportunities identified to offset these costs for both the City and EV owners. The full details of the cost estimate are classified as a Class 5 Rough Order of Magnitude Estimate.

To estimate costs, benefits and potential revenue for a future curbside EV charging pilot, Arup used a financial model to conduct a cost-benefit analysis. Arup calculated the charging price required to achieve a net present value (NPV)* of $0 over 10 years under two utilization scenarios – $0.54 per kWh with a 40% utilization rate (Scenario 2) and $0.48 per kWh with a 45% utilization rate (Scenario 1). With utilization rates between 40% and 45%, estimated revenue ranges from $109,000 to $118,000 per charger each year over the 10 years. In their financial model, the breakeven point when the project begins to see net-positive revenue is in year 8. This analysis did not account for any revenue that could be generated from parking and enforcement related fines which would help to improve the overall financial performance of curbside charging stations. *Net present value reflects how much an investment is worth throughout its lifetime, discounted to today’s value.

Table 8

Item	Unit	Scenario 1	Scenario 2
EV Charging Cost	$/kWh	$0.48	$0.54
Utilization Factor	%	45%	40%
Capital Cost	$	-38,000	-38,000
Operational Cost	$	-4,000	-4,000
Energy Cost	$	-76,000	-67,000
Revenue Estimate	**$**	**$118,000**	**$109,000**
Net Present Value (NPV)	$	$0	$0
Low range for NPV: +50% in capital cost	$	-$18,000	-$18,000
High range for NPV: -40% in capital cost	$	$17,000	$17,000
Breakeven year	**Year**	**8**	**8**

Using public grant funds to cover costs will have two fundamental impacts on the overall cost and revenue generation potential; first, the timeframe where revenue can exceed costs (breakeven year) can be achieved much sooner and perhaps by year 1. And second, the cost to customer can be reduced significantly, closer to the electricity rate from SFPUC, currently around $0.22/kWh in the off-peak and $0.33/kWh in the peak. Whether to use federal, state, regional of local funds for this program is a decision that should be made by elected officials and decision-makers, along with which operating models those decision makers would support.

Findings: The estimated capital cost per Level 2 charger unit is $41,000, with annual maintenance costs of $320 over a 10-year period. (Note this does reflect the ongoing pass through energy costs or staff time at City departments.) Assuming utilization rates are between 40% and 45%, projects can begin to generate revenue at year 8 with estimated revenue ranges between $109,000 to $118,000 per charger each year over a 10-year project lifecycle.

Providing public funds capital costs and possibly operating costs in the early year could support long term economic viability of the nascent technology and ensure stability for people who rely on publicly accessible chargers.

Recommendations: Develop requirements for EV charger operators, and industry partners, that will result in agreements, contracts and rate structures that support a likely outcome of positive revenue generation and avoids creating legal and financial risks for the City of San Francisco. When public funds are involved, site in areas where there is likely to be higher rates of utilization which will help with financial performance while also expanding the coverage of the public charging network. The City should actively pursue funding opportunities, such as grants, that fund EV chargers, to offset upfront costs and improve the affordability of a pilot project.

Review of Governance, Ownership, and Business Models

San Francisco has prior experience with public-private partnerships, notably through arrangements where third-party companies own, operate and maintain EV chargers or maintain City infrastructure such as bathrooms and bus shelters. Additionally, the SFMTA partners with ChargePoint to own and operate its off-street parking garage network, sharing a portion of the revenue generated by charging services. The SFMTA also have a permit system for its scooter share program which involves issuing permits to vendors who meet safety, equity and accountability standards. This relevant experience can serve as a useful guide for establishing a successful governance, business and ownership model to guide the curbside charging network.

Key factors in deciding on an appropriate model include jurisdictional authority over the public right of way, available budget and fiscal resources, staff capacity, and the level of interest from private vendors. San Francisco's limited staffing resources and the lack of capital funds in department budgets mean grant funding and public-private partnerships are crucial to moving forward with a pilot program.

The case studies show that there is not yet a universal framework to determine the most appropriate model for a city to implement an EV charging pilot. However, there are four main elements to consider that can help determine an appropriate model:

- **Service maturity:** reflects how much we know about the service operation model. EV charging is a new business model in a rapidly evolving market with limited long-term operational experience. San Francisco currently has off-street EV charging facilities, but not a curbside network.
- **Staff capability:** reflects how well-prepared city staff are to oversee and manage the pilot. San Francisco has highly capable staff who are ready to oversee and manage the pilot.
- **Staff capacity:** reflects how much staff bandwidth or capacity the City has to manage the pilot implementation process. San Francisco has limited staff resources to manage a pilot program.
- **Budget availability:** reflects how much funding the City has available to cover the upfront capital and operating costs of purchasing and commissioning the charging network.San Francisco does not currently have funds identified in its capital budgets for the pilot and has been aiming to fund the pilot with grants from federal, state, and regional grant programs and local funds from sources such as the SFCTA.

Below are the primary "models" that should be considered as the pilot moves forward:

Model A: advance a public - private partnership wherein there is a contract with a vendor who owns, operates, and maintains the network which is jointly managed by the City and County of San Francisco (CCSF) and revenue is shared by the city and the vendor. This model is successfully used in SFMTA's off street charging network.

Model B: maintain and expand the current private sector led model wherein a vendor proposes projects which are permitted and legislated by CCSF. This model is used in the Mayor's Curbside Electric Vehicle Charging Pilot.

Model C: advance a public network wherein CCSF owns, operates and maintains the network with no private investment or role.

Model D: both Model A and B operate simultaneously.

Key Findings: There are multiple models to choose from when structing partnerships and developing business, governance and ownership models. Key considerations include budget and staff capacity and maturity of the business model.

Recommendations: This report recommends that the City adopt a model, such as Model D, which leverages both private and public resources and expertise to guide the establishment of one unified curbside pilot network. A strategic partnership model should be developed to guide the critical elements of the process including solicitation, intake/screening process and licensing / franchise agreement. An additional recommendation is to advance a solicitation process and issue a request for proposals (RFP) to identify a vendor(s) and establish a public-private partnership business model that clearly defines roles and responsibilities, terms and conditions and a revenue sharing agreement and or a licensing fee. Future contracts and permits should also include language that clarifies who is responsible for removal of any infrastructure at the end of the pilot or if the private party ceases to operate and maintain the charging station. Finally, this report recommends that staff seek direction from decision makers on the preferred model and role of public resources in a future pilot.

Equity Considerations

While San Francisco has made progress in reducing greenhouse gas emissions, it has been falling short in other ways. Income inequality is growing, and housing insecurity, homelessness, and displacement are also worsening. These disparities, among others, are more pronounced when intersected with race. American Indian, Black, and other people of color continue to face significant income inequality, poor health outcomes, exposure to environmental pollutants, low homeownership rates, high eviction rates, and poor access to healthy food, quality and well-resourced schools, and infrastructure. Climate change exacerbates these disparities. People of color and low-income residents are least responsible for, yet most vulnerable to the impacts of climate change. Strategies to reduce greenhouse gas emissions have the potential to exacerbate disparities if not intentionally designed to generate racial and social equity.

As the transportation sector moves toward a more electric future it is important to guide this transition to avoid creating new burdens on communities across San Francisco. This section explores equity related considerations and identifies opportunities for how a future pilot can both reduce pollution and emissions and facilitate a just transition for all communities.

First it is important to acknowledge the past harm of a fossil fuel intensive transportation sector upon communities which include high rates of health burdens, such as increased asthma rates, for many communities who are located near high volume transportation corridors, especially freeways.

Second, it is important to note that adoption of electric vehicles tends to be higher in more affluent communities which have more resources. In California, there are rebates to help offset the costs of a new electric vehicles. Additionally, the auto industry is creating more models at a variety of price points which should lead to more access to electric vehicle markets. In short, adoption and utilization of electric vehicles are not even across San Francisco and more affluent neighborhoods likely have a higher rates of electric vehicle ownership.

We also know that new transportation services such as autonomous vehicles, commuter shuttles and bike share can elicit an array of reactions from communities and some communities may experience these services as elements of gentrification and displacement.

As charging stations are deployed via the Mayor's Curbside Electric Vehicle Charging Pilot, they may be sited in areas where there is higher adoption and utilization rates which will allow these projects to be financially viable. This initial deployment may have the potential to create gaps in a well distributed citywide network. This can be offset by directing public and private investment in a manner that avoids gaps in a citywide network. However, communities should have a role in how their transportation system is managed and developed.

To this point, it will be important to engage in inclusive outreach and engagement opportunities to ensure that community's transportation priorities are at the center of the city's transportation plans and direct the planning and siting process. As the curbside network expansion moves forward, it should focus on identifying community transportation priorities to determine if those priorities include curbside charging. For example, if certain communities are not interested or ready for curbside charging because EV adoption is currently low and on-street parking is at a premium, it will be important to look for off-street options for public chargers and focus curbside chargers in communities that have indicated a stronger interest and whose infrastructure is better prepared for the siting of the next phase of the pilot. This community-based approach will allow communities to shape their local transportation system in a way that meets their needs which is an essential element of community empowerment. In communities that are ready to move forward, a phased approach that includes a monitoring and reporting component should be in place. Such an approach would gather important information such as usage patterns and community feedback which can be shared with the broader community as the pilot moves forward.

There are also planning tools such as the San Francisco Environment Department's Racial and Social Equity Tool (RESEAT) that can be applied to the planning process that can help avoid creating additional burdens on local communities while aiming to generate benefits that are more equitably distributed.

Finally, revenue generated by curbside charging stations should be reinvested to help fund transportation improvements for the City's transit, bicycle and pedestrian network and other transportation investments that align with community priorities and could be used to fund projects in neighborhoods with historic underinvestment in transportation even if they are not ready for creating EV-exclusive curbside parking spaces.

Key Findings: Past investments in transportation have contributed to burdens, such as poor air quality, being disproportionally borne by low-income communities of color. Reducing burdens and creating a just transition to a renewable energy future should be prioritized. This study had limited community engagement, a component that any future pilot should focus on in the future to help ensure that curbside charging aligns with a community's transportation priorities.

Recommendation: Prioritize community engagement to better understand local community's transportation priorities and needs and how curbside charging fits into their priorities. Utilize community feedback to guide initial investments in the network. Utilize monitoring to better understand usage patterns and community impacts and utilize tools such as RSEAT to avoid creating unanticipated burdens on communities.

Literature Review and Case Studies

Staff from SFE and SFMTA conducted a comprehensive literature review and engaged with partner cities to identify insights and best practices for implementing a curbside EV charging program. These efforts highlighted key findings learned from cities such as Berkeley, Los Angeles; New York City, Seattle, and Boston.

- **Community Engagement and Outreach is Critical**
  Effective community outreach is critical throughout the implementation of a curbside EV charging program, including site selection and construction phases. Cities like Boston, New York City, and Seattle employed online portals to gather input from residents on preferred charging locations. Los Angeles, New York City, and Seattle also conducted extensive stakeholder engagement during site selection. Building community support and educating the public about EV's and charging infrastructure were consistently identified as vital components of successful pilot programs.
- **Aim to Generate Equitable Outcomes**
  Prioritizing equity in site selection is a shared goal across many cities. In order to generate equitable outcomes consider prioritizing environmental justice communities, neighborhoods with multi-family housing, and affordable housing without off-street parking access. For example: Boston and New York City acknowledged that EV adoption rates might initially result in lower charger utilization in disadvantaged communities but stressed the importance of prioritizing access to EV infrastructure early. Los Angeles and Boston collaborated with local EV carshare programs to provide affordable, zero-emission transportation options for low-income communities requiring car access.
- **Address Operational Risks**
  Vandalism presents a significant challenge for curbside EV chargers, as noted by Seattle and Los Angeles. To mitigate this issue, Seattle's Level 2 pilot program introduced chargers with retractable cords to deter tampering. Establishing robust maintenance agreements with vendors also helps ensure consistent functionality and a positive user experience.
- **Consider Curb Demands**
  Most cities designate charging spaces as "EV-charging only" with specific time restrictions, requiring vehicles to actively charge while parked. This approach reduces misuse and allows for proper enforcement. Additionally, it is critical to consider existing curb uses during site selection, as areas with metered parking, bike paths, or curbs within 20 feet of crosswalks are typically incompatible with pilot implementation.
- **Partner with Utilities and Grid Managers**
  Local utilities are integral to curbside EV charging programs due to their role in assessing grid capacity and funding infrastructure. For example, In Seattle and New York City, utilities provided significant financial support and co-managed programs alongside municipal transportation departments. Close collaboration ensures streamlined site selection and alignment with grid capabilities.
- **Improve and Expedite Permitting Process**
  Streamlined permitting processes are essential for efficient program implementation. Cities that manage their own charging programs, as well as those partnering with private vendors, benefit from cross-departmental collaboration to expedite permitting and construction. Lessons learned suggest that streamlined permitting is easier to achieve in city-owned programs but remains critical across all models.

Summary of Stakeholder Engagement

Staff from SFE and SFMTA held a webinar on April 17, 2024, to orient interested stakeholders to the feasibility study, gather feedback, and better understand their needs and concerns related to curbside EV charging. Approximately 35 attendees participated, including SF residents, business owners, and members of community organizations and cultural districts. Invitations were sent to local climate and EV associations, non-profit organizations, community-based organizations, disability advocacy organizations, and residents interested in curbside EV charging. The webinar was also promoted via social media channels.

Following the webinar, staff distributed an online feedback form to collect further input on topics such as the level of support for curbside EV charging, EV ownership rates, site preferences, hopes for a curbside EV charging program, and concerns regarding curbside charging. The feedback form was available in Chinese, Spanish, and Filipino and received 19 responses, a number of which were from webinar participants, including 18 SF residents and one SF business owner. Among respondents, 15 owned an electric or plug-in hybrid vehicle, three owned a gas-powered vehicle, and one did not own a car.

Based on feedback from stakeholders, opinions on curbside EV charging ranged from enthusiasm for the program to opposition. While most respondents expressed support under specific conditions, they also raised concerns and shared input on the program's development.

Staff also presented at the San Francisco County Transportation Authority Citizen's Advisory Committee (CAC) and the Board of Supervisor's Land Use and Transportation Committee during the development of the study. There was a robust discussion at the CAC where committee members raised concerns about the city prioritizing curbside EV chargers over potential active transportation and transit improvements, while other members acknowledged the need for automobiles to help meet their daily mobility and business needs while others expressed concerns over using funds for automobile centered infrastructure.

Key Findings from Study Engagement:

- **Balance demands on the curb:** Many community members voiced concerns about the potential loss of parking spaces and the impact of curbside chargers on bike and transit lanes, emphasizing the need to balance EV infrastructure with other transportation priorities.
- **Create an equitable and affordable network for multiple users:** Affordability of EV's and the perceived exclusivity of curbside EV charging programs were recurring concerns. Participants highlighted the need for equitable access, particularly for low-income and underserved communities. The community expressed interest in eBike charging and parking being incorporated into the charging station design.
- **Improve grid access and ensure chargers are maintained:** Several respondents flagged concerns about the reliability of the electricity grid and the potential for vandalism of EV chargers, stressing the importance of robust maintenance and security measures to ensure system functionality.
- **Concerns over investing in assets that benefit automobiles.** Given that electric vehicles are still vehicles which still impact air quality and create adverse public health outcomes, there was concern that without intentional policies, this program could conflict with other transportation policies and projects that prioritize the right of way for transit, bicyclists and pedestrians.

Summary of Industry Engagement

Staff from SFE and SFMTA met with key members of the EV charging industry to orient them to the study, gather feedback, and better understand industry trends and best practices. Staff interviewed four curbside EV charging service providers (FLO, Gravity Technologies, ItsElectric, and Voltpost). Staff also created an online industry feedback form and emailed it to a broader list of EV charging service providers to collect general feedback. Staff have also been in direct contact with the three providers who are advancing projects via the Mayor's Curbside Electric Vehicle Charging Pilot including, ItsElectric, Urban EV and Voltpost to better understand how future phases of the pilot should continue to engage and leverage industry expertise, skills and best practices. Given the industry is rapidly evolving, particular focus should better understanding the changes in technology, financing and the user interface to ensure the public's interests are prioritized.

Funding Strategies

Beyond private capital, several public funding sources are available from local, regional, state and federal sources which can support the capital and operational costs associated with implementing EV charging pilot. Sources can include agencies such as the San Francisco County Transportation Authority which has allocated approx. $150K for the next phase of the work. Regional, state and federal agencies such as the Bay Area Air Quality Management District, Metropolitan Transportation Commission, California Energy Commission and United States Department of Transportation Federal Highway Administration and the United States Department of Energy Joint Office of Energy and Transportation also administer grant programs. Funds can also be identified in local capital and operating budgets to cover expenses related to staffing, grid improvements and other costs. Please see Appendix II for additional funding sources.

- Specific examples include the SFCTA's Transportation Fund for Clean Air; https://www.sfcta.org/funding/transportation-fund-clean-air
- Metropolitan Transportation Commission's Climate Program Implementation grants;
- California Energy Commission's "Clean Transportation Program; https://www.energy.ca.gov/programs-and-topics/programs/clean-transportation-program

Other funding opportunities to support scaling of the pilot program could include congestion pricing, special parking permit zones, and advertising.

Summary Findings and Recommendations

This section contains summary findings and recommendations for advancing the next phase of the curbside EV charging pilot. These recommendations address key challenges and provide a roadmap for the establishment of a curbside EV charging pilot in San Francisco.

Findings:

- **The permitting and regulatory landscape is complex:** San Francisco Public Works, Department of Building Inspection, San Francisco Public Utilities Commission & Pacific Gas and Electric, San Francisco Municipal Transportation Agency and the San Francisco Planning Department are required to issue an array of permits and approve legislation which adds to the timeline slowing project delivery.
- **Grid access and readiness is a big obstacle:** charging projects must find existing excess capacity which may not align with other grid demands leading to delay and high costs.
- **A network of curbside chargers is needed and also must be sited intentionally:** publicly-accessible curbside chargers should be located in areas with multifamily buildings with no off-street parking that have higher EV ownership rates while avoiding impacts to the complex transportation network of San Francisco, including local business parking and delivery needs, Muni curb access needs, bikeways, etc.
- **It can take up to 8 years to generate revenue:** there are a number of eager private sector companies interested in investing and partnering on a curbside EV charging network in SF, eight years is very long time to recover costs and for monitoring and management of a stable charging network.

Recommendations:

- **Expedite permitting and improve oversight:** Develop a new permitting process that streamlines the necessary approvals by bundling them together to improve efficiency and results in faster deployment. A recent example of this approach would be the approach used for securing Accessory Dwelling Unit permits. A "lead" implementing agency should also be identified to lead the development of an expedited permitting process and develop legislation that will streamline permitting and review processes and propose updates to relevant codes.
- **Site strategically and integrate with multimodal transportation system:** The siting of charging stations should be strategic, avoiding conflict with transportation systems such as transit and bicycle networks reflecting each community's transportation priorities as identified through community engagement and outreach. Ensure that accessibility guidelines are developed early in this process to guide the responsible siting of units that provide both access to chargers and to the adjacent access surrounding EV charging stations
- **Engage the community:** Bring the community, prioritizing work in equity communities, and focusing on residents and businesses, into a more specific discussion about curbside charging, it's trade-offs and whether or not a curbside charging network aligns with their transportation priorities. Include this work in City transportation projects and programs, as appropriate.
- **Seek direction from decision makers on how the City should partner with private EV charging operators:** Identify an operational, governance and business model(s) that the City would support as it works with private charging companies to develop a network of curbside chargers. Clarify the appropriate role of public funding in the support of this direction.
- **Ensure private partners are vetted and approved:** Identify and implement a well-structured process for ensuring that EV charging companies are likely to fulfill their obligations, maintain their equipment and remain responsible for it until they remove it or transfer ownership to an approved vendor.

Acknowledgements:

This Curbside Electric Vehicle Feasibility Study was authored by the San Francisco Municipal Transportation Agency (SFMTA) with close collaboration from the San Francisco Environment Department (SFE). The team also acknowledges the technical support provided by Arup.

SFMTA: Tim Doherty, Maya Price, Casey Leedom, Maia Small, John Knox White

SFE: Henna Trewn, Nicole Appenzeller

Arup: Alejandro Echeverry, Joseph Kaylor

Additionally, this report has benefitted from the review and input of many individuals and departments within the City and County of San Francisco including the following departments:

- San Francisco Public Works
- San Francisco Public Utilities Commission
- San Francisco County Transportation Authority
- Department of Building Inspection
- San Francisco Planning Department

Memorandum

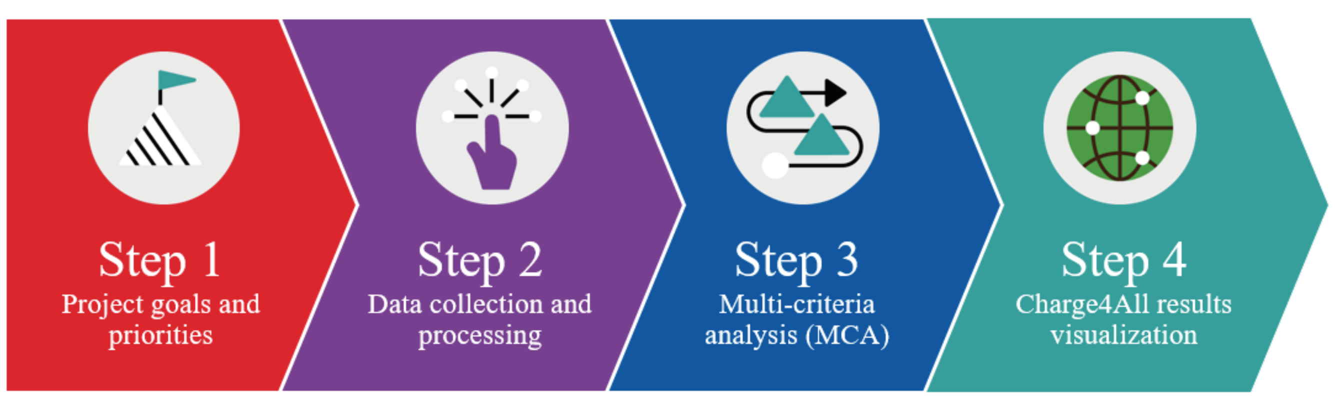
To	Maya Price, SFMTA Tim Doherty, SFMTA Nicole Appenzeller, SFE Henna Trewn, SFE
Date	July 12, 2024
Copies	
Reference number	V3.0
From	Alejandro Echeverry, Arup Samantha Lustado, Arup
File reference	
Subject	Task 4 Site Suitability and Selection Memo

1. Introduction

The City and County of San Francisco is exploring potential sites and neighborhoods to implement a curbside EV charging pilot. Arup developed a site suitability process to help determine locations that are more suitable for the implementation, using a quantitative multi-criteria analysis (MCA) framework. This framework was based on a criteria weighting process that has been developed with the City (SFMTA and SFE project staff) to ensure that the selection is aligned with City goals.

2. Methodology Approach for the Site Suitability

The site suitability study used Arup's Charge4All proprietary process and platform, encompassing the following main stages that will be described in this section.



2.1 Project goals and priorities

The Arup team facilitated a workshop with SFMTA and SFE staff. During the workshop, Arup and City staff discussed how the analysis would be used, what are the key drivers for site selection and how

these align with the City's goals. This discussion resulted in the definition of nine main criteria themes that served as the base for the multi-criteria analysis (MCA) framework. Arup guided a weighting exercise during the workshop where City staff were individually asked what criteria were most relevant to select a suitable site.

The criteria are available as levers or sliders in the Charge4All tool (see example in Figure 3), providing the flexibility to test different criteria weights and their impact on final results. Below is the list of the nine criteria that were used in the site selection and suitability process.

- **EV Adoption:** this criterion identifies areas where there is evidence of greater ownership of EVs and internal combustion engine vehicles (ICEV). Higher current EV adoption and higher ICEV vehicle ownership – signaling future EV adoption – will support higher utilization of the EV chargers and make a site more suitable for pilot implementation.
- **Curb Use:** this criterion encompasses sub-criteria related to street typology, sidewalk width, presence of existing or planned bike paths, and average dwell times at the curb. Streets with wider sidewalks, with no conflicts with high quality bike paths, and that have lower vehicle turnover in residential neighborhoods will minimize conflicts with EVs charging at the curb, making a site more suitable for pilot implementation.
- **Socio-Economic:** this criterion identifies areas of special interest for the pilot implementation from an equity lens. Four different sources are incorporated into the scoring, that include locally defined environmental justice communities, regionally defined Equity Priority Communities from MTC, state-defined disadvantaged areas from CalEnviroScreen, and federally defined disadvantaged communities from Justice40. This criterion also prioritizes areas with more multifamily dwellings (MFDs), which typically have greater needs for on-street parking. Higher density of communities of interest and MFDs will help target the pilot to population that are less likely to have the means to install EV chargers in their property and make a site more suitable for pilot implementation.
- **Energy:** this criterion evaluates the available grid capacity across the city. Higher grid capacity allows EVs to draw power to charge with lower costs associated to the installation of additional electrical infrastructure (e.g., transformers), making a site more suitable for pilot implementation.

  Note: there is limited publicly available information for grid capacity, thus the source for this data is a static snapshot which does not necessarily represent capacity at different times of the day, specific peaks in demand, or over an extended period of time.
- **Land Use:** this criterion assesses the surrounding land uses, as well as the availability of public spaces. Residential or mixed-use neighborhoods with limited off-street parking are likelier use the curbside EV chargers on a more regular basis and make a site more suitable for pilot implementation.
- **Policy:** this criterion encompasses sub-criteria related to curb accessibility (ADA) and excavation moratorium. Streets that have compliant ADA provisions and no excavation moratoria at the curb will have less delays due to non-compliance and make a site more suitable for pilot implementation.

  Note: streets with excavation moratoria shall be excluded from the site selection.

- **Mobility Patterns:** this criterion assesses the vehicle miles traveled in a specific area, which will serve as a proxy to understand the needs and demand for EV charging through more vehicle demand. Higher VMT translates into greater charging needs for EVs, making a site more suitable for pilot implementation.
- **Risk and Resilience:** this criterion identifies areas with higher vulnerability to flooding and seismic risk. Lower risk vulnerability will make a site more suitable for pilot implementation.
- **Safety:** this criterion identifies areas that have higher reports of damaged property (311 reports for damaged property), which is an important risk for the EV chargers. This has been the case in the case studies in New York City, Boston and Los Angeles, where they have had to explore mechanisms to prevent vandalism. This has a significant impact on maintenance cost and can make a pilot unfeasible. Lower density of reports of damaged property will make a site more suitable for pilot implementation by minimizing maintenance due to vandalism.

  Note: there are other elements that influence safety that are difficult to capture in this quantitative analysis. Streets with good lighting and where drivers feel safe will also make a site more suitable for pilot implementation. However, the presence of public light posts does not directly translate to a safe well-lit space. Consequently, lighting is not part of the safety criteria analysis.

There are some criteria that currently have a 0% weight: mobility patterns, risk and resilience, and safety. These are still available as levers or sliders in the Charge4All tool, and as such can be modified to be included as weighted criteria if needed.

2.2 Data collection and processing

Arup prepared a Request for Information (RFI) that included a list of data points that would capture the criteria determined in the workshop. The available data sets were incorporated into the Arup Charge4All tool for a map visualization.

2.3 Multi-criteria analysis (MCA)

The MCA pulls the available data, establishes a scoring parameter for each one, and aggregates results in a unit area, based on the assigned weights for each criterion. Charge4All has a geospatial or map interface that allows to visualize the data sets in San Francisco. For purposes of the analysis, the City was divided into hex unit areas (hexagons) that are 0.01 square miles, similar to the size of a street block.

Arup prepared the scoring parameters for each of the defined criteria, with a score of 5 assigned for high suitability, 3 for medium suitability, and 1 for low suitability. This approach not only facilitated a nuanced evaluation of each criterion but also provided a quantitative foundation for the site selection process.

Determining the weight allocated to each criterion is another crucial aspect that significantly shapes the decision-making process. Criteria weighting in this study involved assessing the relative importance of different criteria and reflecting their significance in the overall decision context. The choice of a suitable weighting methodology was key to ensuring an evaluation of alternatives that responds to the City's goals and priorities. For further information about the MCA process, see the Appendix.

ARUP

2.4 Charge4All results visualization

Arup's Charge4All proprietary tool uses Esri's ArcGIS suite of tools and Safe Software's FME ETL program to automate the MCA process which allows us to seamlessly overlay various layers and accurately compute scores based on the assigned weighting to each criterion.

Charge4All centralizes all data that is used for the analysis in a geospatial format, which enables the visualization of all information available in a map. The City of San Francisco is divided into hexagons (hexes) of about 0.01 square miles, which are about the average size of a quadrant of city blocks. The results from the MCA are visualized at the hex level, meaning that each hex has scores for all the evaluation criteria. Sites that are more suitable appear in darker shades of green, and sites that are less suitable appear in lighter shades of green.

The results not only support a quantitative data-driven recommendation of neighborhoods, sites, and/or streets of potential EV charging infrastructure, but also provide access to a web-based visualization platform to enable interaction with the analysis results. Charge4All is set up with two main visualization modules: 2D map and EV site selection.

2.4.1 2D map

The 2D map is a compilation of all the available data sets that were collected in the study, available in a geospatial format. Data sets are arranged by layers under each criteria and can be individually selected or hidden. As an example, Figure 1 illustrates the data set for transit stops in the City.

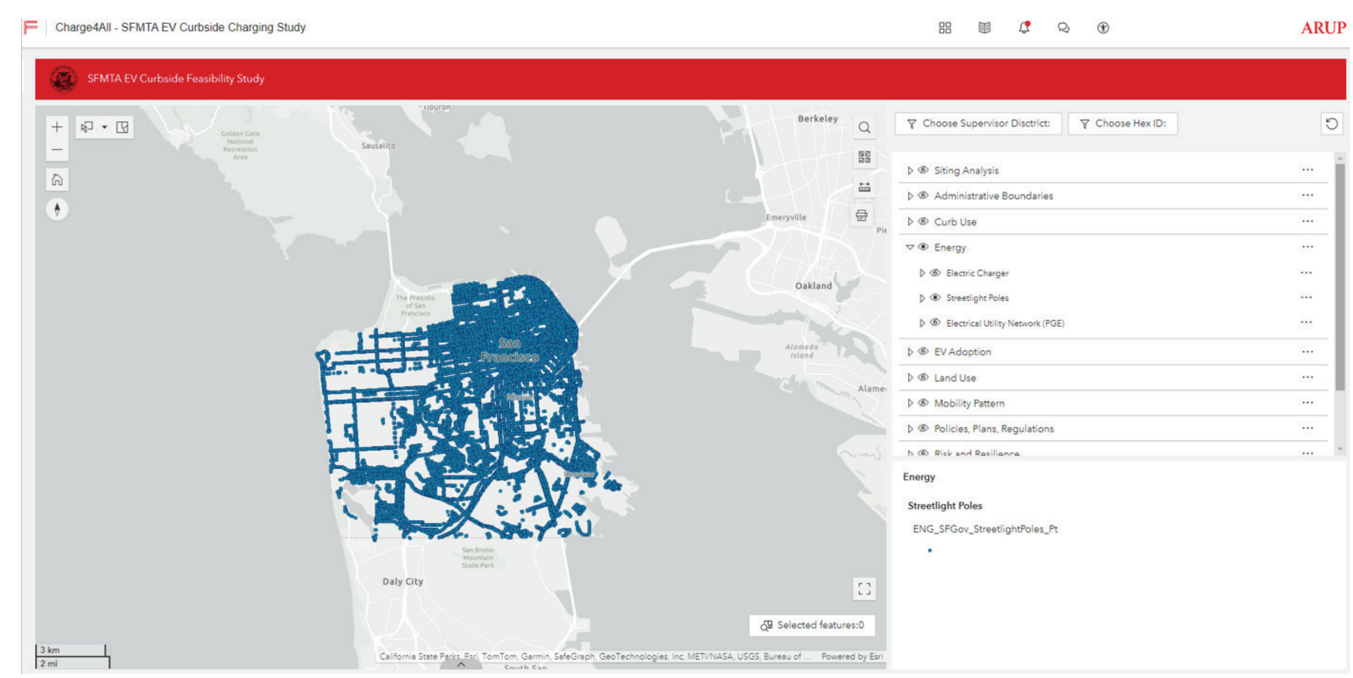


Figure 1. Example of a data set layer in the 2D map module

The MCA results are aggregated at hex level. However, the available data is also used at a more granular level to illustrate what segments of the curb are more appropriate for the installation of EV chargers. Figure 2 is an example of the curb analysis layer in the 2D map module, where blue segments illustrate suitable curb space to install EV chargers, and red segments where unsuitable.

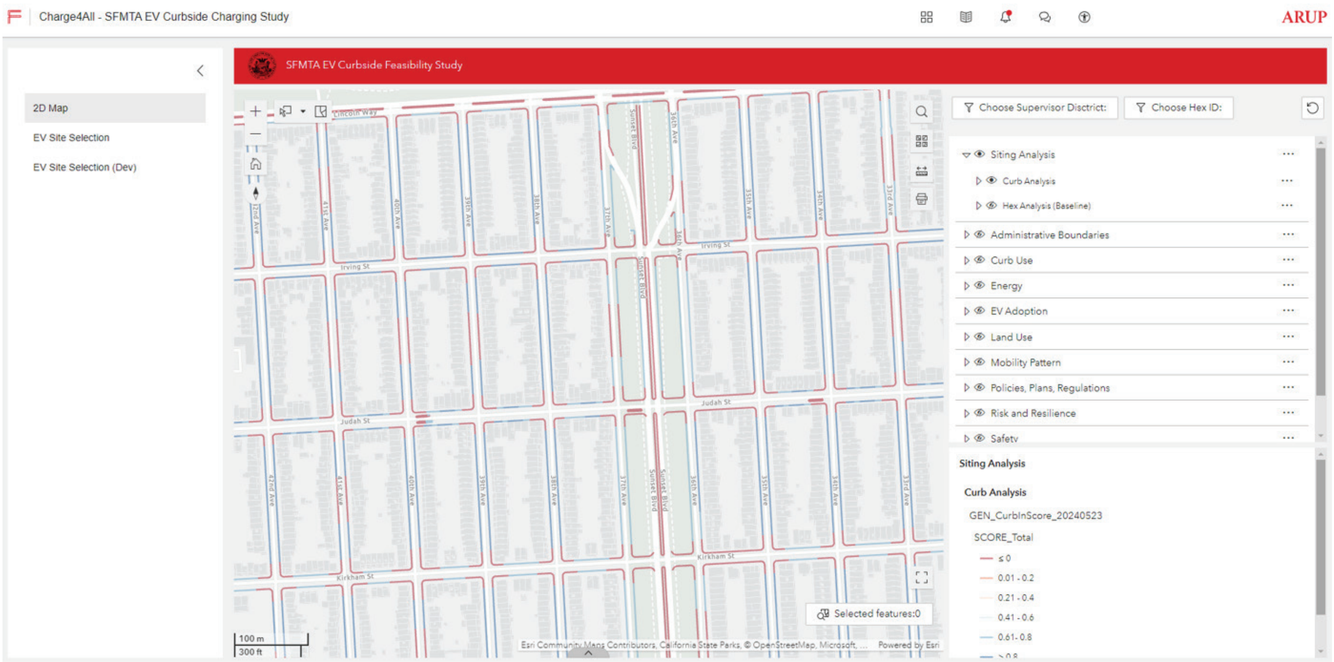


Figure 2. Sample from the curb analysis layer in the 2D map module

2.4.2 EV site selection

The EV site selection module is where Charge4All displays the MCA results. Each of the criteria have individual sliders that are set as default on the weights that resulted from the project goals and priorities workshop. The map illustrates the City subdivided into hexes in shades of green. Darker shades represent higher-scoring and more suitable areas in the city, whereas lighter shades are lower-scoring and less suitable.

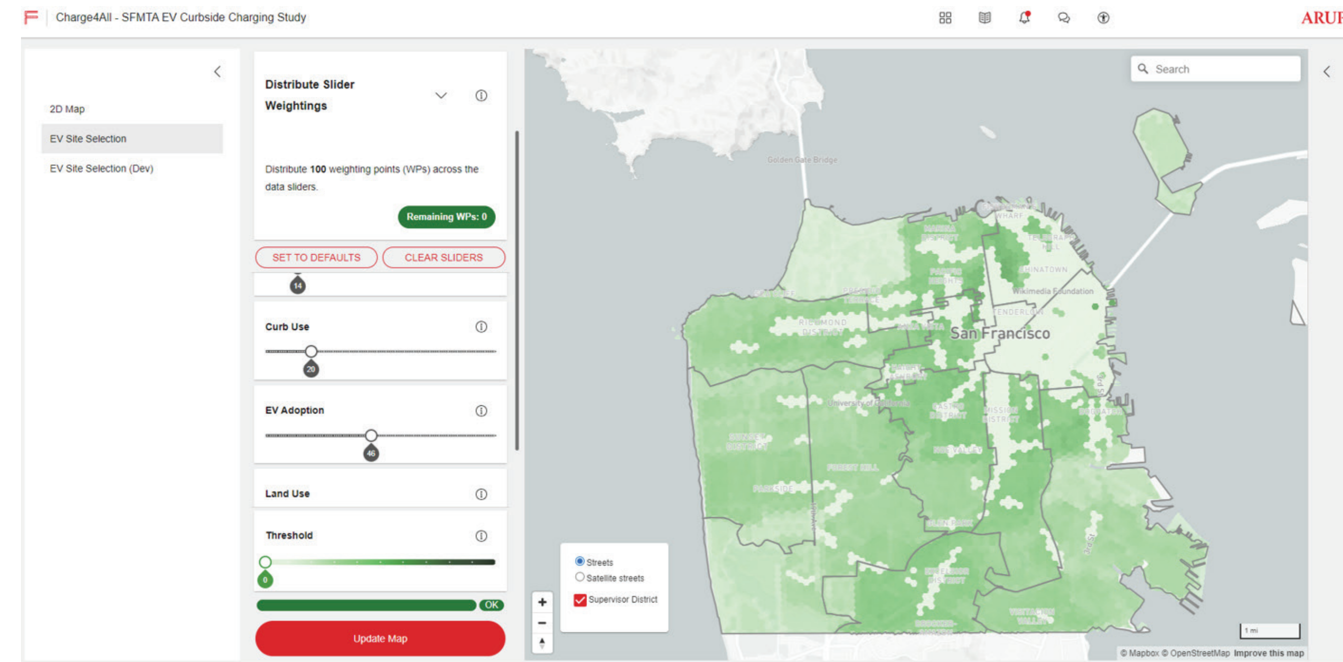


Figure 3. Sample from the EV site evaluation module

3. Site Suitability Analysis

The site suitability analysis that the Arup team performed in Charge4All is quantitative, based on available data and statistically derived weights, in alignment with the City's goals and priorities. While this quantitative approach allows for a more robust selection process, it is also important to acknowledge human bias, occuring in the process of selecting the evaluation criteria and their weights or significance in the overall analysis.

Consequently, the site suitability results in this section should be interpreted as providing guidance to neighborhoods and areas that have greater potential for implementing a curbside EV charging pilot, based on available data. These results are intended to provide the City with data-driven opportunity areas that can be further refined with additional qualitative criteria and local experience.

3.1 Curb considerations for the site selection

Our analysis results are summarized at the hex level. A single hex can include more than one street segment with different curb characteristics that can make subsections of the hex more and less suitable for a pilot implementation. This subsection will describe some of the main curb considerations when determining if a site is suitable for the curbside EV charging pilot.

3.1.1 Bike paths and shared bike docking stations

Bike paths are designed to be accessible and comfortable for cyclists. Introducing EV charging points may create obstacles for cyclists, especially when the driver is plugging in the vehicle. Bike paths that are fully protected from vehicular lanes (class I and IV) will be affected at a greater extent than buffered or shared paths (class II and III). To avoid potential conflicts, the project team recommends that EV chargers for this pilot not be installed adjacent to current or proposed bike paths.

Shared bike docking stations (Baywheels) are mainly installed on the curb and could compete for space with EV chargers. However, with e-bikes growing in popularity, there is an opportunity to combine EV services (bike and car) in adjacent locations. The project team recommends that the City assess the relevance and pertinence of locating EV chargers adjacent to shared bike docking stations when the pilot advances to phase B.

Figure 4. Bike infrastructure in San Francisco (bike paths and Baywheels docking stations)

3.1.2 Metered parking spaces

Metered parking spaces represent an important revenue source for the City. Implementing a pilot on a street with metered parking would necessarily imply the removal of a paid space for any vehicle type. While curbside EV charging can also be considered a paid space, the project team recommends that the pilot focus on locations that currently do not generate revenue. Metered parking spaces in the City were

automatically disqualified from the analysis and not considered for the site suitability, to prevent the City from losing revenue or impacting commercially established zones.

Figure 5. Metered parking in San Francisco

3.1.3 Daylighting Zones

The State of California recently adopted AB 413 ("Daylighting Law"), which states that vehicles cannot park within 20 feet of the approach of any marked or unmarked crosswalk, even if the approach does not have red curbs painted. This law went into effect on January 1, 2024, and will be enforced starting January 1, 2025. Since parking is not allowed within 20 feet of a crosswalk, this area was also deemed unsuitable for EV chargers.

3.1.4 Color curbs

San Francisco has a color curb system that facilitates loading and servicing for different uses. White zones are intended for passenger pickup and drop-off; blue zones are for ADA parking; yellow zones for commercial loading of trucks and heavy vehicles; and red zones can indicate fire lanes, a bus stop, or protected areas for driveways. EV chargers must not be located on any colored curb segments to avoid conflicts with other existing uses.

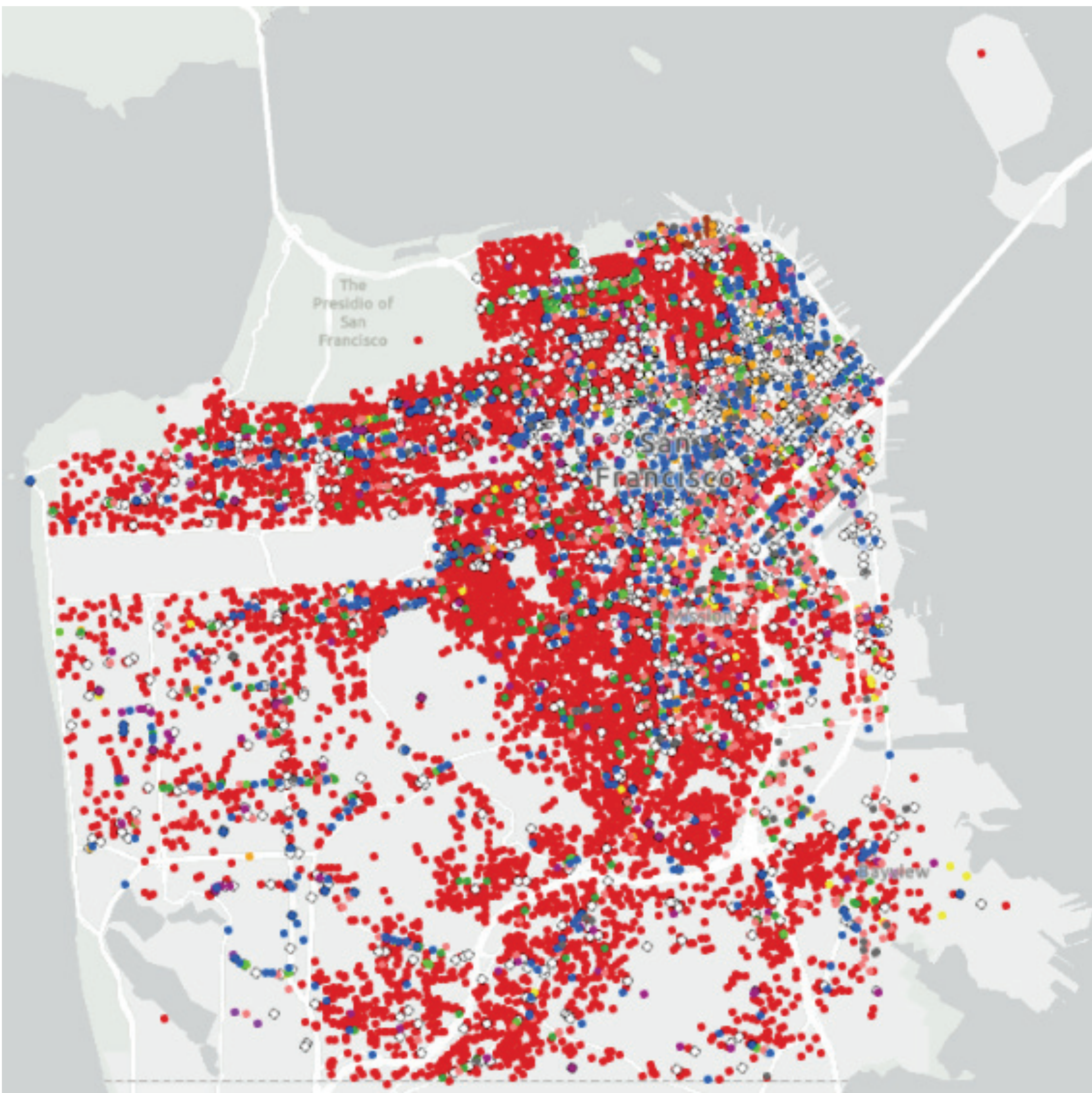


Figure 6. Color curbs in San Francisco

3.1.5 Existing off-street EV chargers

San Francisco currently has an extensive network of off-street EV chargers that are distributed throughout the City. Figure 7 shows these are distributed in main commercial areas that include Downtown, SoMa, Financial District, North Beach, Tenderloin, Mission Bay, and Marina, among

others. The focus of this suitability and selection was on sites and neighborhoods that have limited access to these facilities.

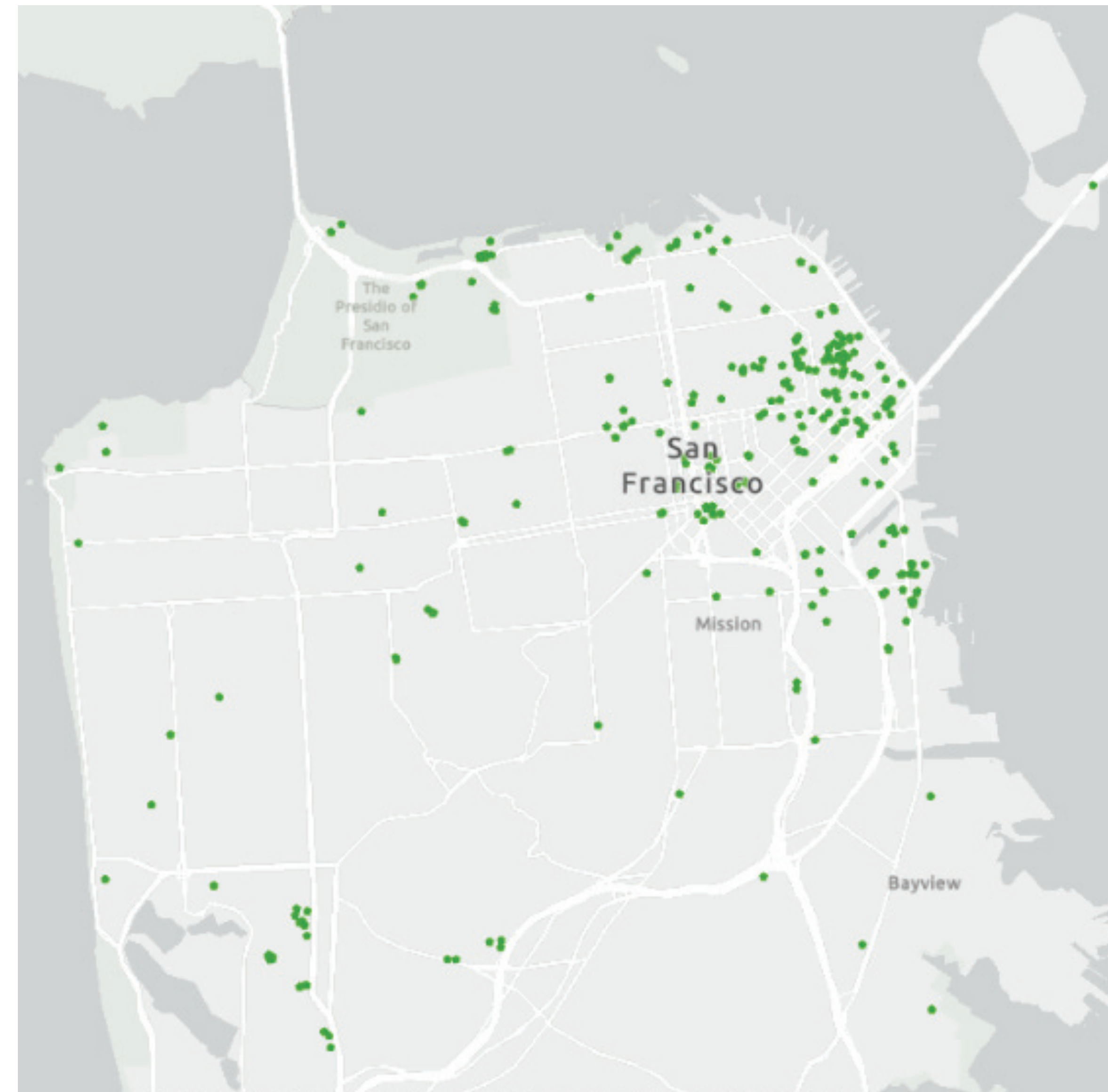


Figure 7. Off-street EV chargers in San Francisco

3.1.6 City owned land and buildings

City-owned buildings are served by the SFPUC. Installing EV chargers adjacent to a City-owned building could facilitate opportunities for the pilot to gain access to power behind-the-meter.

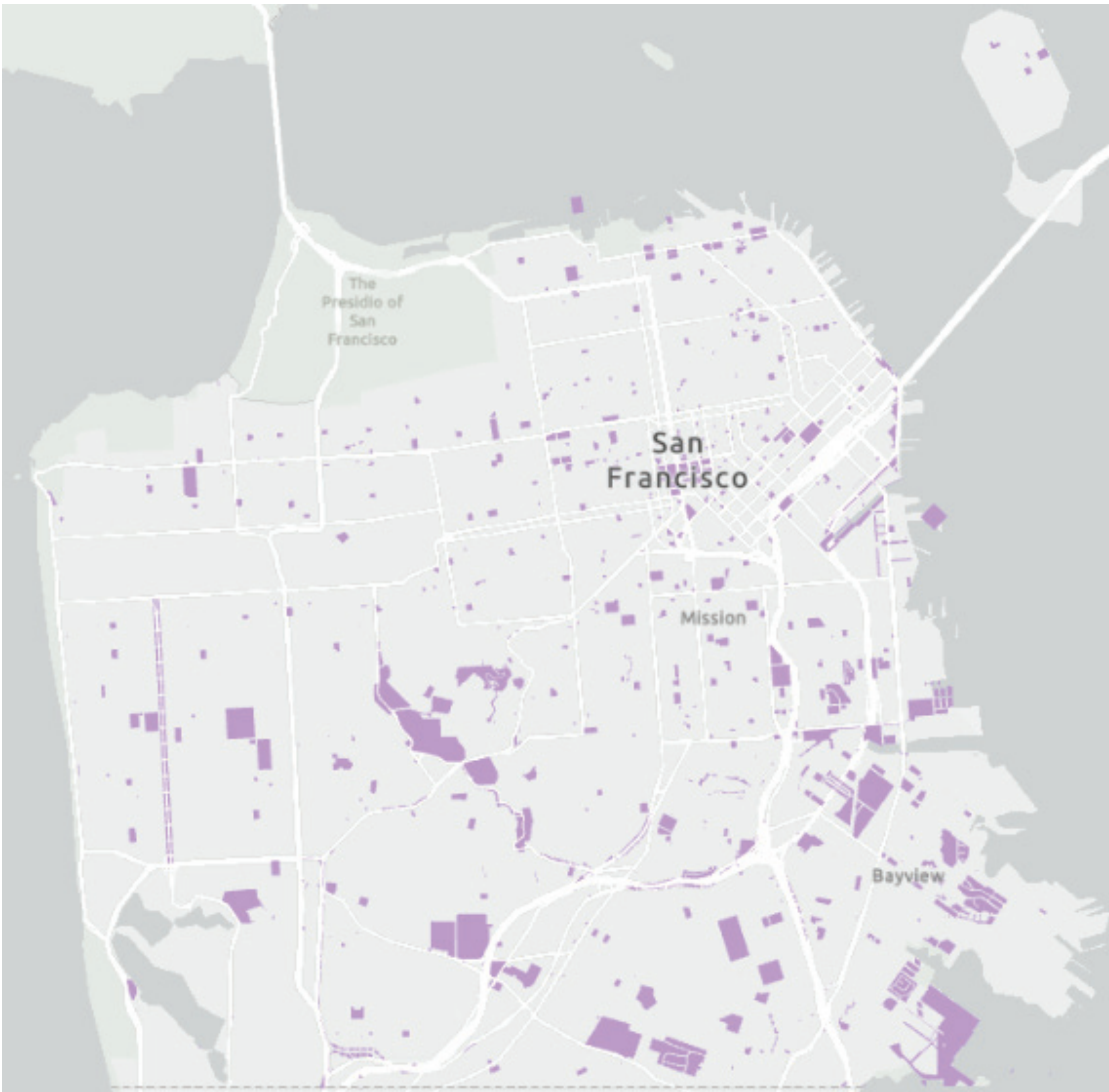


Figure 8. Publicly owned land and buildings in San Francisco

3.1.7 Slope

The mayor's office issued a series of guidelines for the curbside EV charging program. One of the guidelines is related to accessibility, stating that the access to the chargers cannot be built at a slope greater than 5%. Considering the prevalence of streets and sidewalks in San Francisco that have slopes greater than 5%, this will require further analysis to confirm that a site is indeed suitable for the pilot implementation.

3.2 Site suitability analysis results

3.2.1 Capturing different priorities for the site suitability

As mentioned in section 2.1, the project team prepared and facilitated a project priorities workshop to help identify the most relevant evaluation criteria to determine site suitability for the curbside EV

charging pilot, in alignment with the City's goals. While the staff in attendance had a good understanding of these goals, relative priorities can be subjective and shift among people and agencies consulted.

The Charge4All platform was set up to test different criteria priorities and capture their impact on the overall site suitability results in real-time. The EV site selection module has a visual interface that allows the user to modify the criteria weights with a slider tool for each one. Each of the sliders can be allocated a score from 0 to 100, yet all of them must add to 100 for the tool to evaluate (think of each slider as a percentage of total weight). Arup developed sections 3.2.2, 3.2.3, and 3.2.4 to illustrate specific site suitability results when giving one criterion more weight relative to the others: grid capacity, socio-economic, and EV adoption.

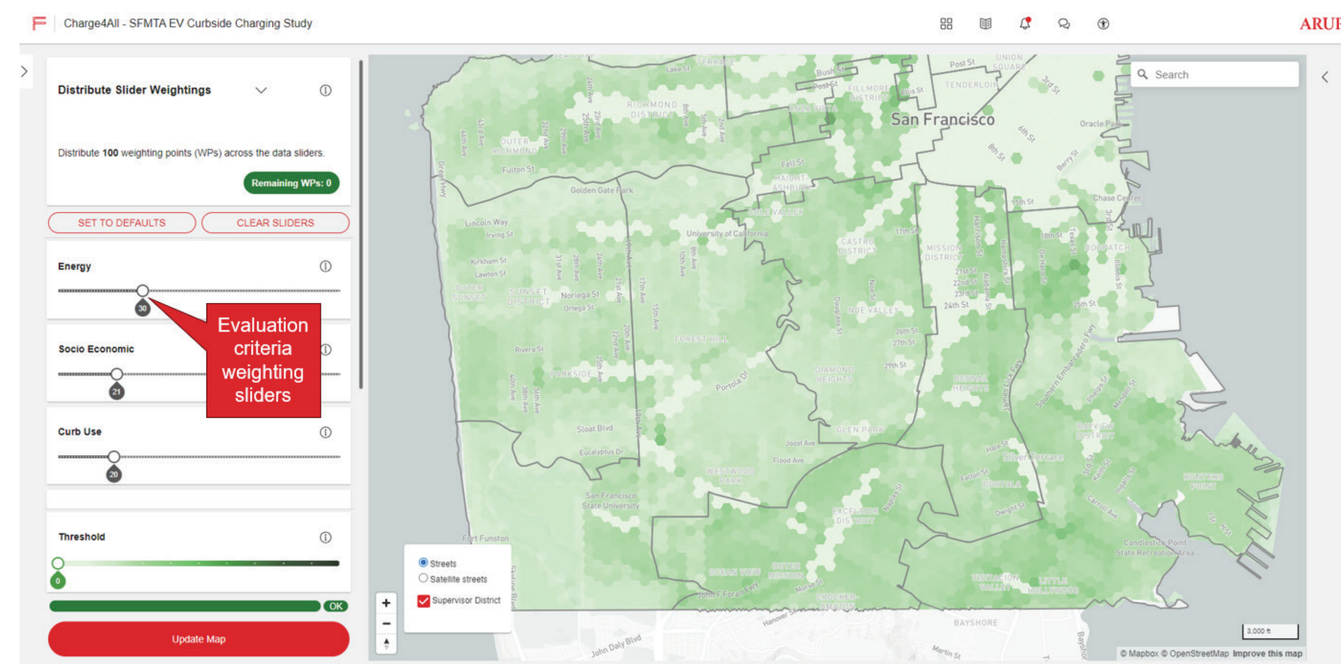


Figure 9. Charge4All EV site selection module and the evaluation criteria weighting sliders

3.2.2 Cluster results for grid capacity as top criterion priority

The energy criterion identifies areas in the City where there is static evidence a higher grid capacity to support EV charging. Figure 10 illustrates this criterion as the most critical in the Charge4All EV site selection module. The top 10 city-wide sites (hexes) are located in Supervisorial Districts 5, 2, 10 and 7, representing a good spread (see table Table 7 in the appendix). It is important to note that according to the available data, grid capacity is constrained in most of the city, thus sites have low scores for the energy criterion. This can be observed in the figure with highest priority sites showing lighter shades of green when comparing to the evaluation with other criteria priorities (see figures in sections 3.2.3 and 3.2.4, where most suitable sites show darker shades of green).

The blue dots in the figure indicate the site clusters with the highest suitability for each of the Districts. As shown in the figure, all Districts have more than one high suitability site cluster when prioritizing energy as the most critical criterion.

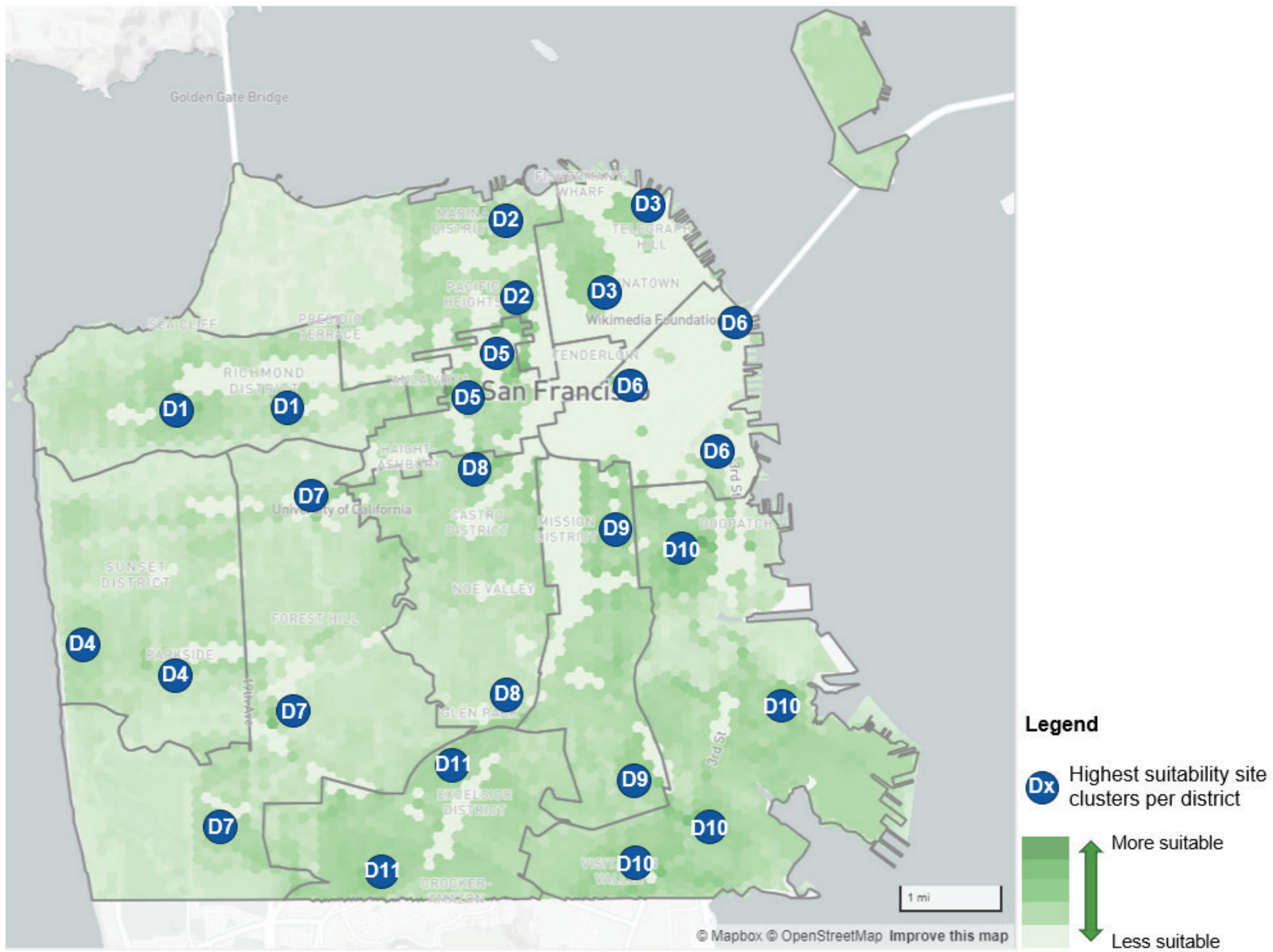


Figure 10. Site suitability results: energy as the most critical criterion (weights from the priorities workshop)

3.2.3 Cluster results for socio-economic as top criterion priority

The socio-economic criterion identifies areas in the City with the highest density of equity priority zones, as defined at a federal (Justice40), state (CalEnviroScreen), and regional (MTC) level. Figure 11 illustrates this criterion as the most critical in the Charge4All EV site selection module. The top 10 city-wide sites (hexes) are concentrated in Supervisorial Districts 10 and 9 (see Table 8 in the appendix).

The blue dots in the figure indicate the site clusters with the highest suitability for each of the Districts. Some Districts have clearer clusters with high suitability, such as 2 and 5. Others like 10 and 11 have clusters that could be similarly suitable when prioritizing socio-economic as the most critical criterion.

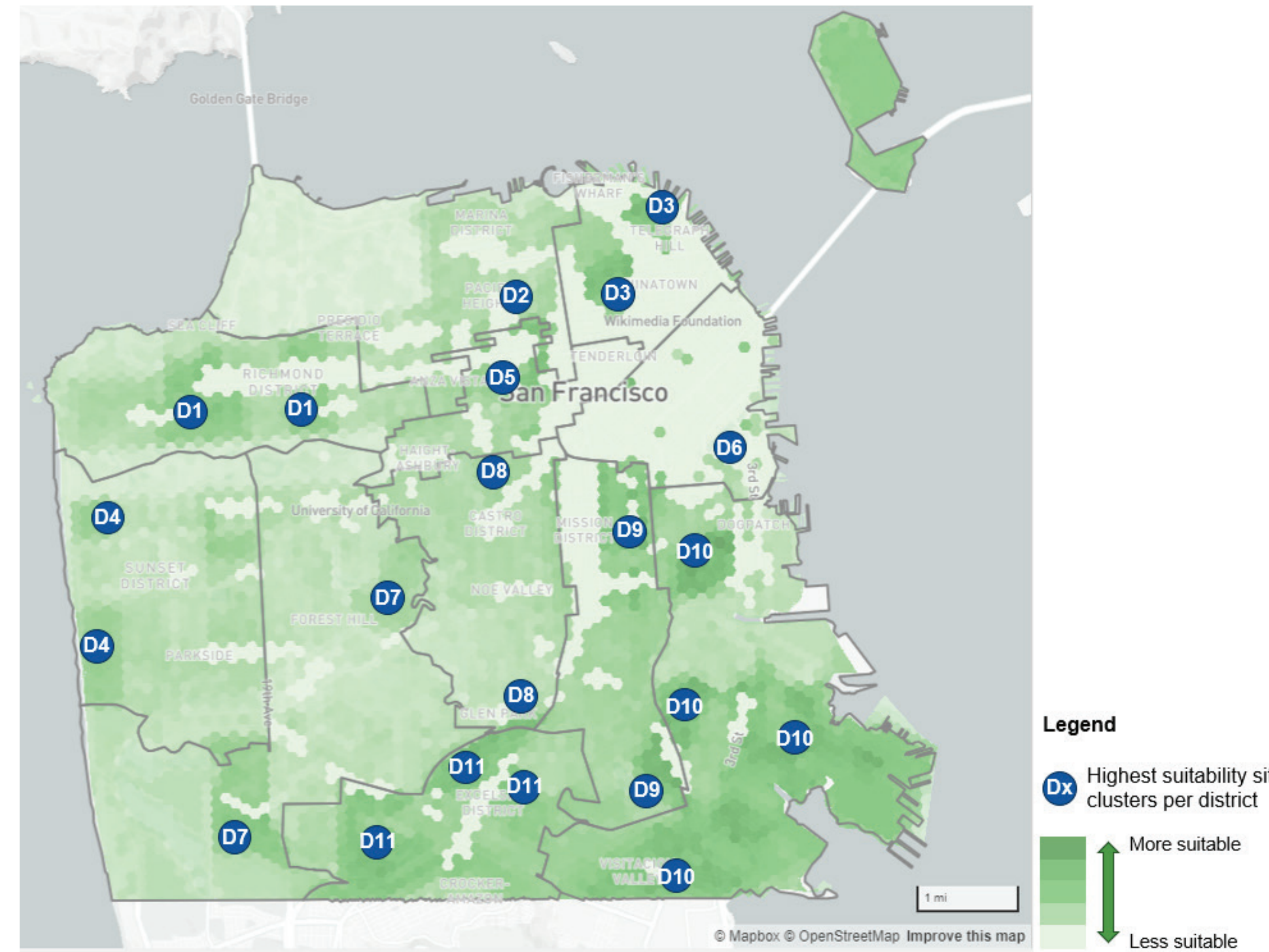


Figure 11. Site suitability results: socio-economic as the most critical criterion

3.2.4 Cluster results for EV apotion as top criterion priority

The EV adoption criterion identifies areas in the City where there are higher ownership rates of EVs. Figure 12 illustrates this criterion as the most critical in the Charge4All EV site selection module. The top 10 city-wide sites (hexes) are located in Supervisorial Districts 6, 3, 2, and 5, representing a good spread (see Table 9 in the appendix).

The blue dots in the figure indicate the site clusters with the highest suitability for each of the Districts. Some Districts have clearer clusters with higher suitability, such as 4 and 5. Others like 8 and 11 have clusters that could be similarly suitable when prioritizing EV adoption as the most critical criterion.

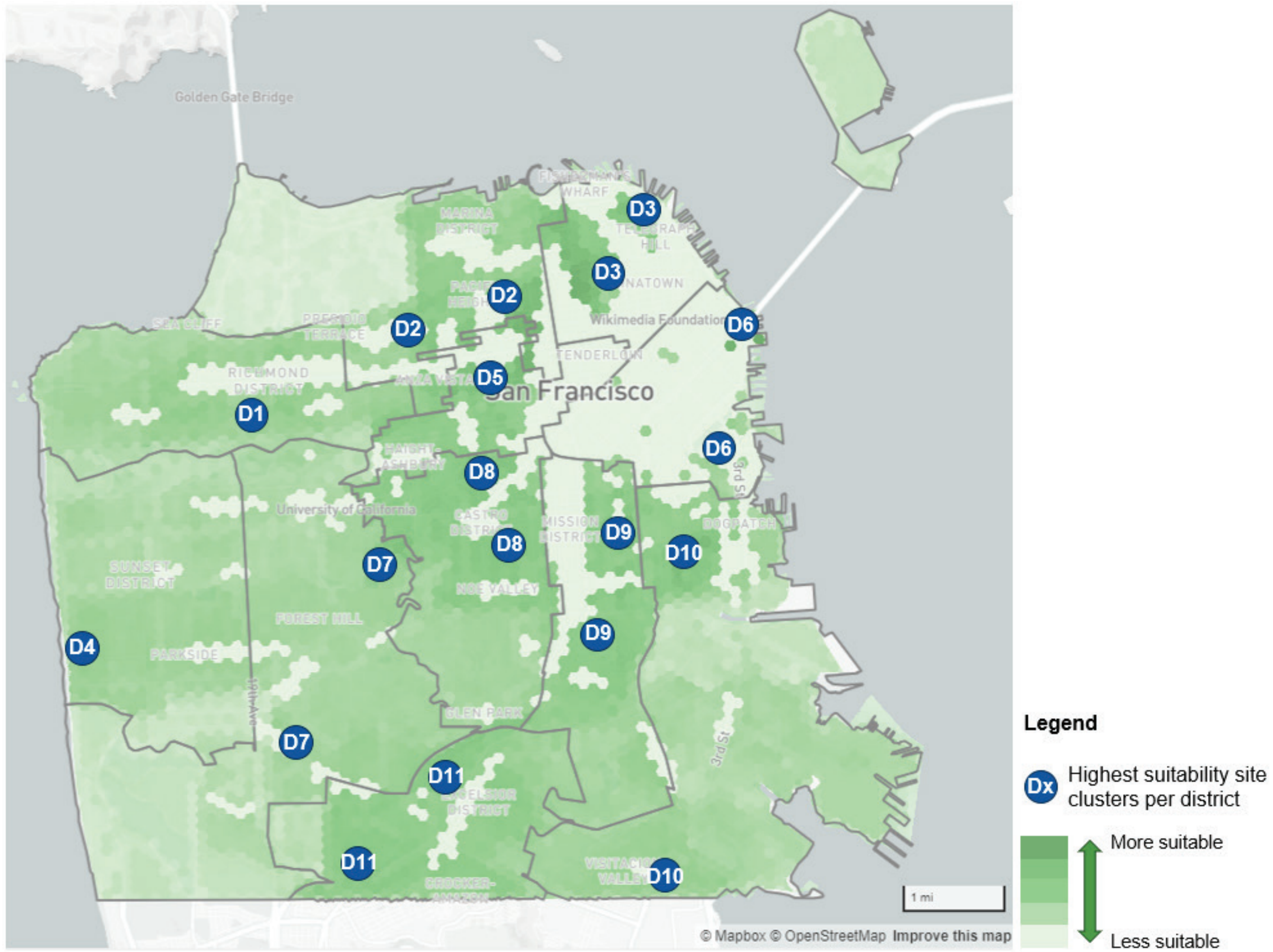


Figure 12. Site suitability results: EV adoption as the most critical criterion

3.2.5 Top clusters in each Supervisorial District

The previous three sections illustrated site suitability results specific to prioritizing the following criteria: grid capacity (energy), socio-economic, and EV adoption. The main takeaways to note are the following:

- **Grid capacity:** with the static information available, the results show that greater grid capacity is concentrated in smaller areas in the City. Overall site suitability scores are lower compared to other criteria priorities (lighter shades of green), and top city-wide locations are in Districts 5, 2, 10, and 7.
- **Socio-economic:** based on the equity priority areas at federal, state and regional level, top city-wide locations are in Districts 9 and 10.
- **EV adoption:** based on the available information on EV ownership, top city-wide locations are in Districts 6, 3, 2, and 5.

Figure 13. Comparison of the site suitability results with different criteria prioritizations

4. Key Findings & Recommendations

Arup used the Charge4All proprietary platform to process and manage the available data sets, followed by a multi-criteria analysis (MCA) for the site suitability. The analysis involved reviewing different criteria priorities to observe their impact to the overall results and identify clusters with greater potential in each of the Supervisoral Districts.

We have also identified important curb considerations that will help determine whether a site is suitable. Our baseline assumes that metered parking, bike paths, curbs within 20 feet of a crosswalk, and color curbs are incompatible with the pilot implementation.

The most important finding from this analysis was the fact that all Districts in the City and County of San Francisco have feasible and suitable sites for a curbside EV charging pilot, regardless of the criteria deemed as most important during the evaluation.

After finalizing the site suitability analysis, we recommend the neighborhoods in Table 1 as most suitable to implement the pilot. The 2D map module of Charge4All provides additional guidance on specific restrictions at the curb scale when looking at the locations in further detail.

It is important to note that these results are based on a quantitative analisys that incorporates a potentially subjective criteria weighting exercise. City staff should confirm that this recommendation does in fact align with their goals and priorities as the site selection process is refined to curb level.

Table 1. Recommended neighborhoods for the pilot implementation

Supervisorial District	Neighborhoods with higher suitability for pilot implementation	Neighborhoods that are within MTC equity priority communities (EPC)
1	Central and Outer Richmond	No

Supervisorial District	Neighborhoods with higher suitability for pilot implementation	Neighborhoods that are within MTC equity priority communities (EPC)
2	Marina and Lower Pacific Heights	No
3	Chinatown and North Beach	Yes (Chintown)
4	Parkside and Outer Parkside	No
5	Western Addition and North of the Panhandle	Yes (Western Addition)
6	Mission Bay and South Beach	No
7	Balboa Terrace and Midtown Terrace	Yes (Balboa Terrace)
8	Duboce Triangle and Glen Park	No
9	Mission and Portola	Yes
10	Potrero Hill, Bayview, and Visitacion Valley	Yes (Bayview and Visitacion Valley)
11	Mission Terrace, Outer Mission, and Excelsior	Yes

Appendix

Detailed Framework Workflow

The detailed suitability analysis model seen in Figure 14 is an overview of Arup's Charge4All process and platform. This includes hosting a project priorities workshop with SFMTA and SFE using the suitability analysis and tool, determining data and criteria, collecting and standardizing data, computing suitability analyses, and visualizing results.

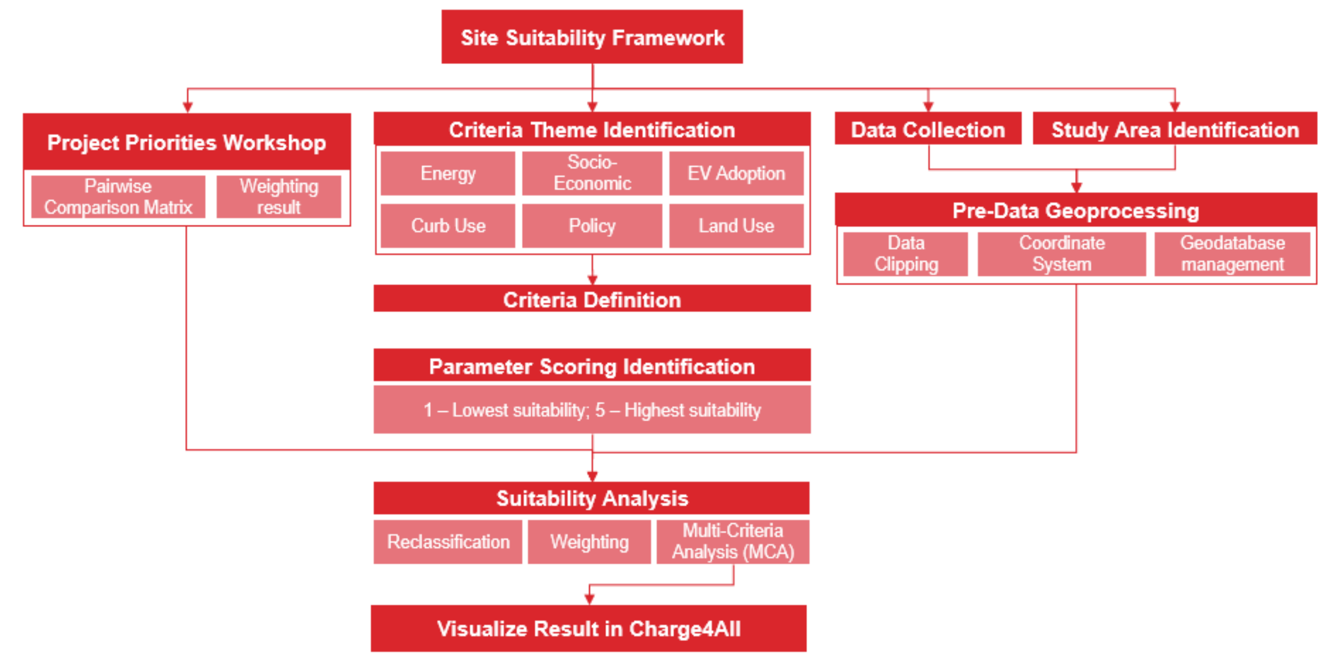


Figure 14. Site suitability detailed framework

List of data points included in the MCA

Table 2 outlines the subcriteria for assessing site suitability for charging station, grouped by each of the nine criteria defined for the study.

Table 2. List of data points used in the site suitability module of Charge4All (MCA)

No.	Criteria	Data Point	Description	Parameter Rationale for a site area (hex)
1	Energy / Utility	Snapshot of existing electrical utility network	Available electrical grid capacity for the EV chargers	Higher grid capacity is more suitable
2	Socio-economic	Multifamily dwellings	Density of multifamily dwellings	Higher density of MFD is more suitable
3	Socio-economic	EJ Communities score	SF Environmental Communities score	Higher score is more suitable

No.	Criteria	Data Point	Description	Parameter Rationale for a site area (hex)
4	Socio-economic	CalEnviroScreen	CalEnviroScreen communities score	Higher score is more suitable
5	Socio-economic	Justice40	Federal Justice40 communities score	Higher score is more suitable
6	Socio-economic	MTC Equity Priority Communities Map	MTC EPC communities score	Higher score is more suitable
7	EV Adoption	Vehicle ownership at zip code level	Density of private vehicle ownership	Higher density is more suitable
8	EV Adoption	EV Vehicle ownership at zip code level	Density of EV ownership	Higher density is more suitable
9	Curb Use	Road network typologies	Street hierarchy: freeway, major street, arterial street, collector street, residential street	Local residential streets are more suitable, commercial streets and faster boulevards less so
10	Curb Use	Sidewalk widths	How wide sidewalks are on a street, to support EV charging with less disruption to pedestrians	Wider sidewalks are more suitable
11	Curb Use	Bike lane network	What type of bike lanes -if any- in a specific area	Streets with no installed bike lanes are more suitable
12	Curb Use	Average vehicle dwelling time	Average vehicle dwell time for trips in a selected area	Lower dwell times are more suitable
13	Policy	On-street parking policy	Identifies the presence of colored curbs that restrict parked vehicles	Higher presence of restricted curb zones is less suitable
14	Policy	Excavation moratorium	Streets that have been repaved or intervened in the last five years	Presence of moratoria is unsuitable
15	Policy	ADA curb ramp accessibility	ADA compliance and accessibility	Greater accessibility compliance is more suitable
16	Land Use	Mixed use	Presence of mixed-use developments in a selected area	Higher presence of mixed-use is more suitable
17	Land Use	Public area	Presence of public owned buildings in a selected area	Higher presence of public-owned buildings is more suitable
18	Land Use	Residential	Presence of residential use in a selected area	Higher presence of residential is more suitable
19	Risk and Resilience	Flood risk	Flood risk in a specific area	Lower flood risk is more suitable
20	Risk and Resilience	Seismic hazard	Seismic risk in a specific area	Lower seismic risk is more suitable

No.	Criteria	Data Point	Description	Parameter Rationale for a site area (hex)
21	Mobility Pattern	Vehicle Miles Travelled (VMT)	Average VMT in a specific area	Higher VMT average is more suitable
22	Safety	Damaged property	Density of 311 complaints related to damaged property	Lower density of complains is more suitable

Criteria parameters definition

Following the definition of criteria, the subsequent phase involved assigning scores to parameterize each criterion. This critical step required quantifying the importance or relevance of specific parameters within each criterion. These scores served as a crucial metric, providing a structured means to assess the significance of various factors.

To streamline the scoring process, each indicator was categorized into four distinct groups: high, medium, low, and unsuitable, which can be seen in Table 3. High suitability signifies that a location possesses favorable characteristics for a specific criterion, which could include aspects like regulatory alignment or EV charging demand. On the contrary, low suitability indicates unfavorable characteristics for a specific criterion.

Unsuitable locations were assigned a score of zero and are flagged to identify sites that have conditions that would make it a ‘non-starter’. The analysis used the presence of parking meters as a ‘non-starter’ criteria. This means that locations that have metered parking will not be considered for the site suitability, to prevent the City from losing revenue or impacting commercially established zones.

Table 3. Criteria Parameters

Criteria Parameter Value	Criteria Parameter Group
0	Unsuitable
1	Least Suitable (Low Suitability)
2	Less Suitable
3	Suitable (Medium Suitability)
4	More Suitable
5	Most Suitable (High Suitability)

Criteria weighting

Various methods exist for criteria weighting, and the chosen approach should align with the available data, and the preferences of those involved in the decision-making process. For the baseline weightings for this study, Arup used a statistical method called the Analytical Hierarchy Process (AHP).

AHP is a method for organizing and analyzing complex decisions, using math and psychology[1]. It uses paired comparison, or two criteria at a time, to determine the relative weights of various criteria, and then it transfers them across each level of criteria to calculate overall weightings[2]. The distinctive power of AHP lies in its ability to transfer these relative weights across each level of criteria within the hierarchy. This ensures that the overall weightings reflect the aggregated preferences of decision-makers at all levels, providing a comprehensive and inclusive representation. While AHP offers a robust methodology for criteria weighting, it's important to acknowledge that the choice of a weighting method depends on the specific context and preferences of stakeholders. This section will delve into the application of AHP within the Multi-Criteria Analysis (MCA) process, shedding light on its practical implementation in our decision-making framework.

A key aspect of the AHP revolves around its emphasis on pair-wise comparisons. During this step, stakeholders carefully assess the relative importance of one criterion compared to another. Using a scale from 1 to 9, where 1 signifies equal importance and 9 implies a stronger importance of one criterion over the other, participants express their judgments. This methodical evaluation helps transform subjective views into numerical values, forming a solid basis for subsequent stages in the decision-making process.

The result of these pair-wise comparisons is a decision matrix, subject to various statistical calculations like matrix normalization, consistency testing, weighting calculation, and more. These computations contribute to determining the weight assigned to each criterion or category. The identification of importance levels during pair-wise comparisons is usually gathered through discussions with stakeholders or decision-makers where everyone on the workshop will individually identify which criteria is more important compared to others. This approach ensures a thorough and systematic decision-making process with AHP.

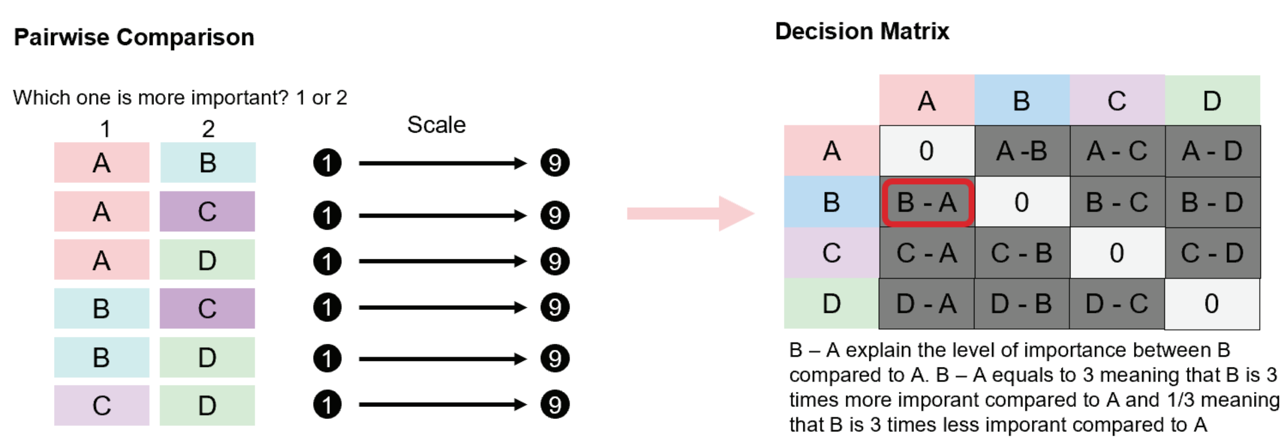


Figure 15. Pairwise comparison as part of Analytical Hierarchy Processing (AHP) to identify decision matrix

[1] https://www.passagetechnology.com/what-is-the-analytic-hierarchy-process

[2] https://www.mindtools.com/a7y139c/the-analytic-hierarchy-process-ahp

Below is an example of the weighting result and decision matrix from a sample report.

Priorities

These are the resulting weights for the criteria based on your pairwise comparisons:

Cat		Priority	Rank	(+)	(-)
1	MD/HD Vehicle Population	10.4%	6	9.9%	9.9%
2	Annual average daily truck traffic	4.8%	7	2.1%	2.1%
3	Land Use	19.6%	1	18.5%	18.5%
4	Electric Grid Capacity	18.7%	2	22.5%	22.5%
5	Curb Charging	15.0%	4	18.6%	18.6%
6	In priority Population	17.0%	3	4.8%	4.8%
7	City fleet priority sites	14.6%	5	8.2%	8.2%

Number of comparisons = 21
Consistency Ratio CR = 25.8%

Decision Matrix

The resulting weights are based on the principal eigenvector of the decision matrix:

	1	2	3	4	5	6	7
1	1	3.00	2.00	1.00	0.14	0.33	0.25
2	0.33	1	0.50	0.50	0.50	0.20	0.33
3	0.50	2.00	1	2.00	5.00	1.00	1.00
4	1.00	2.00	0.50	1	6.00	1.00	1.00
5	7.00	2.00	0.20	0.17	1	1.00	1.00
6	3.00	5.00	1.00	1.00	1.00	1	2.00
7	4.00	3.00	1.00	1.00	1.00	0.50	1

Principal eigen value = 9.071
Eigenvector solution: 11 iterations, delta = 1.1E-8

Figure 16. Criteria weighting and decision matrix example

Arup implemented the AHP methodology to assign weights to all criteria themes utilized in the process, aiding in the identification of top priority factors for determining EV charging station locations. Throughout the workshop, Arup facilitated exercises to help SFMTA staff in discerning the most critical criteria, including energy/utilities, socio-economic factors, EV adoption, curb use, policy considerations, and land use. Participants engaged in discussions and provided insights on the relative importance of each criterion, facilitating pair-wise comparisons to quantify their significance accurately. This process ensured a comprehensive evaluation to facilitate a decision around the location for EV curbside charging stations.

Figure 17. AHP Process

To initiate the Analytic Hierarchy Process (AHP), we began by collecting data from the workshop participants. Each participant engaged in pairwise comparisons to determine the relative importance of different indicators. Following the workshop, we quantified the results to facilitate the AHP process. This quantification is detailed in Table 4, which displays the identified conversions.

Subsequently, we constructed a decision matrix using the quantified data. This matrix visually represents the levels of importance of one indicator over another. We then calculated the average of each indicator's column to assess its overall importance. Next, we normalized the decision matrix by dividing each cell by its respective column average. Once this step was completed, we computed the average row values to obtain the weightings for each criterion.

After calculating the weightings, we conducted a consistency check to ensure the reliability of the results. This check determines whether the derived weightings are consistent and accurate for making informed decisions.

Table 4. Indicator prioritization quantification

Criteria	Value	Criteria	Value
Extremely less important	-9	Equally important	1
Much less important	-7	Slightly more important	3
Less important	-5	Moderately more important	5
Slightly less important	-3	Much more important	7
		Extremely more important	9

We then used the average scores given across all participants to calculate an overall decision matrix to identify priority score for each of the criteria compared to other criteria.

Table 5. Decision matrix

	Energy / Utilities	Socio-economic	EV Demand	Feasibility (curb-demand / turnover)	Policy	Land Use
Energy / Utilities	1.0	1.8	2.6	1.4	4.2	4.2
Socio-economic	0.6	1.0	1.8	2.2	3.4	1.8
EV Adoption	0.4	0.6	1.0	0.3	3.8	3.0
Curb Use	0.7	0.5	3.4	1.0	4.6	1.0
Policy	0.2	0.3	0.4	0.2	1.0	0.4
Land Use	0.2	0.6	0.3	1.0	2.6	1.0
Cumulative Score	**3.1**	**4.7**	**9.5**	**6.1**	**19.6**	**11.4**

By calculating the percentage of each comparison value to the cumulative score, we could then calculate the weighed importance of each comparison and average it to get the final weight for each individual criterion. Apart from this process, we also calculated a consistency index.

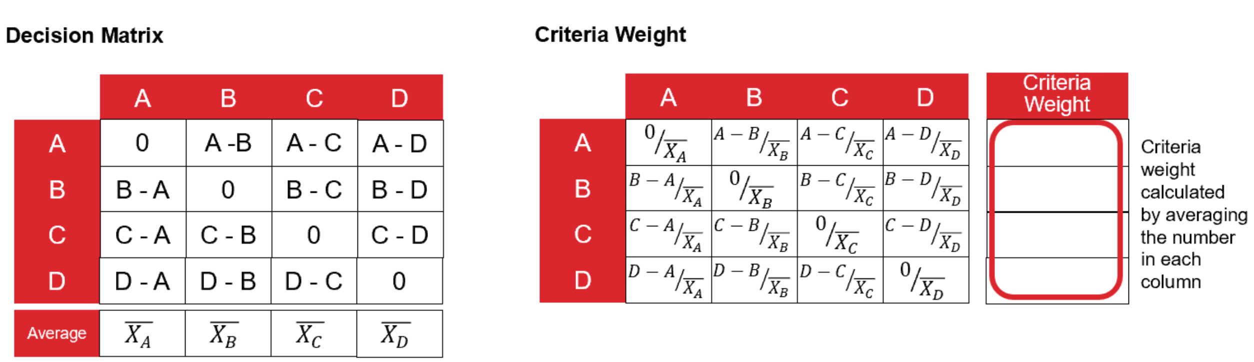


Figure 18. Converting decision matrix to criteria weights

Table 6. Criteria weights from the priorities workshop

Criteria	Ranking	Criteria Weight
Energy / Utilities	1	30%
Socio-Economic	2	21%
Curb Use	3	20%
EV Adoption	4	14%
Land Use	5	10%
Policy	6	5%
Mobility Patterns	7	0%
Risk and Resilience	8	0%
Safety	9	0%

According to the table above, energy/utilities emerged as the highest priority criteria, underscoring its pivotal role in site assessment for EV charging stations. The availability of reliable energy and utilities infrastructure is paramount for the successful deployment and operation of charging stations, highlighting the critical importance of assessing this criterion thoroughly in the decision-making process.

While the baseline suitability analysis will incorporate the top six criteria themes identified during the workshop, other analyses were performed to support other data and criteria that were deemed important to the City.

Top 10 city-wide sites for grid capacity as top weighted criterion

Table 7. Top 10 city-wide sites for grid capacity as top weighted criterion

Position	Cross streets	Neighborhood	District
1	Turk St and Broderick St	Western Addition	2 and 5
2	Texas St and 22nd St	Potrero Hill	10
3	Buchanan St and North Point St	Marina	2
4	Laguna St and Ellis St	Western Addition	2 and 5
5	Eddy St and Broderick St	Western Addition	2 and 5
6	3rd St and Le Conte Ave	Bayview	10
7	Laguna St and Eddy St	Western Addition	2 and 5
8	Monterey Blvd and San Rafael Way	St Francis Wood	7
9	San Bruno Ave and Arleta Ave	Visitacion Valley	10
10	Pennsylvania St and 22nd St	Potrero Hill	10

Appendix II Funding Strategies

Grant Program	Administrator	Award Range	Eligible Projects	Justice40 Commitments	Key Dates
Grid Resilience and Innovation Partnerships (GRIP) Program	U.S. Department of Energy	$10 million - $50 million Minimum 50% cost match required for Topic 2	Topic Area 2 – Smart Grid Grants Electric vehicle charging infrastructure, vehicle-to-grid technologies	Requires a Community Benefits Plan and scores based on Justice40 commitments	Funding allocated through 2026
Communities Taking Charge Accelerator	U.S. Department of Energy	$250,000 - $4 million No cost match required	Topic Area 1 – Solving for No-Home Charging Public charging models, curbside charging infrastructure, charging hubs, rate design	Requires a Community Benefits Plan and scores based on demonstrated DEIA, equity, and labor objectives	Funding allocated through 2026
Energy Efficiency and Conservation Block Grant (EECBG) Program	U.S. Department of Energy	$796,610 allocation for the City of San Francisco No cost match requirement	Category 14 – Transportation Electric vehicle charging infrastructure, vehicle procurement, innovative financing models for renewable energy	Not required but is a scoring factor	Funding allocated through 2026 NOFO announced in July 2023 Full application due October 31, 2024
Rebuilding American Infrastructure with Sustainability and Equity (RAISE)	U.S. Department of Transportation	Up to $25 million Minimum 20% cost match required	Capital or Planning Grants Electric vehicle charging infrastructure when coupled with other major surface transportation or intermodal transportation projects	Not required but is a scoring factor	Up to $25 million Minimum 20% cost match required
Charging and Fueling Infrastructure (CFI) Discretionary Grant Program	Federal Highway Administration	$500,000 to $15 million Minimum 20% cost match required	Community Program – Community Charging and Fueling Electric vehicle charging infrastructure	Requires an Equity Assessment demonstrating at least 40% project benefits towards Justice40 communities	Funding allocated through 2026
California's National Electric Vehicle Infrastructure (NEVI) Formula Program	California Energy Commission	$2.4 million to $12.15 million Minimum 50% cost match required	Electric vehicle charging infrastructure	Not required but is a scoring factor	Funding allocated through 2026
EnergIIZE Commercial Vehicles Program	EnergIIZE in collaboration with the California Energy Commission	Up to $500,000 No cost match required	EV Public Charging Station Funding Lane Electric vehicle charging infrastructure serving both municipal fleets and public access	Not required but is a scoring factor	Rolling applications starting February 7, 2024

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