

STREETLIGHT CHARGING IN THE CITY RIGHT-OF-WAY

A COMMUNITY PERSPECTIVE

Kansas City, MO

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Streetlight Charging in the City Right-of-Way is a project undertaken by Metropolitan Energy Center and its partners, which include the City of Kansas City, MO; Evergy, Inc.; Missouri University of Science and Technology; Pennsylvania State University; National Renewable Energy Laboratory; EVNoire; Black & McDonald; LilyPad EV; Westside Housing Organization; and other community-based organizations that prefer to remain unnamed. Funding for the project was provided by the U.S. Department of Energy. The project team collaborated on a variety of arenas, including technical, policy, and outreach and engagement. This report is an account of the work to engage residents in decision-making for charging station siting. The authors acknowledge and thank contributors from each of these organizations.

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EVNoire centers **e-mobility, diversity, equity and inclusion**, as we accelerate toward a clean mobility future. EVNoire are Dr. Shelley Francis, Terry Travis, and Alexis Blomqvist and can be reached on the web at evnoire.com.



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Glossary of Terms

| Term | Definition |
|---|--|
| Community Based Organization (CBO) | Organizations that work with and are based directly in communities they serve |
| Dwell Time | Refers to the time a vehicle such as a public transit bus spends at a scheduled stop without moving; affected by factors such as passenger activity, bus crowding, fare collection, driver experience, and time of day. In reference to electric vehicles, it is the time a car spends at a charging facility, which may or may not correspond to the time spent actively charging. |
| Electric Vehicle (EV) | Any vehicle that operates, either partially or exclusively, on electrical energy from the grid, or an off-board source, that is stored on-board for motive purpose |
| Electric Vehicle Supply Equipment (EVSE) | Equipment that delivers electrical energy from an electricity source to charge plug-in electric vehicle batteries including (but not limited to) Level 1, Level 2, and Direct Current Fast Charger (DCFC), often referred to as EV charging stations. |
| First/Last Mile Gaps | The “last-mile” or “first-mile” connection describes the beginning or end of an individual trip made primarily by public transportation. The “gap” is the distance a commuter needs to travel from a transit stop to their destination, or vice versa. This must be completed by walking, driving or another method |
| Home Owner’s Loan Corporation (HOLC) | The Home Owner’s Loan Corporation was a government sponsored corporation created as part of the New Deal. The corporation was established in 1933 by the Home Owners’ Loan Corporation Act |
| Micromobility | Transportation over short distances provided by lightweight, usually single-person vehicles (such as bicycles and scooters) |
| Privileged Mobility | Systems of transportation that reinforce existing privileges and magnify them |
| Transportation Ecosystem | A complex system that refers to the equipment and logistics of transporting passengers and goods that covers movement by all forms of transport from cars and buses to boats, aircraft and even space travel. The collection of transportation options that comprise the transportation landscape which impacts the ecosystem through multiple direct and indirect interactions and degrades air quality, leads to noise and water pollution, and climate change |

Project Background and Overview



The Streetlight Charging in the City Right-of-Way project seeks to substantially increase access to electric vehicle (EV) charging in Kansas City, Missouri with attention to future usage as well as equity concerns, while saving time and money by combining charging stations with existing streetlight infrastructure. As part of the effort, the team seeks to identify end-user needs and gather information on stakeholders' interests and concerns, including how to install stations with a focus on providing equitable access to Electric Vehicle Supply Equipment (EVSE) and EV adoption. In order to ensure that the project meets the community needs, a significant portion of the project focuses on **community research** to understand both the current landscape and the future implications that the project presents.

Metropolitan Energy Center (MEC) leads this project in coordination with local and federal project partners. The United States Department of Energy (US DOE) provided funding for the project. The project team collected data on local traffic patterns to determine the best sites for streetlight charging in on-street applications. The team selected the charging and data technologies based on existing data sharing partnerships. When site selection is finalized, MEC will supervise deployment, handling codes, construction and signage issues as they arise. The team will compile data on network usage and submit the data to the National Renewable Energy Laboratory (NREL) for analysis once initial data collection concludes. Penn State will check the accuracy of the predictive modeling against real-world data received, and create a final study that covers lessons learned, best practices in analysis and deployment, and build a replicable model of this approach to siting EVSE in city right-of-way.

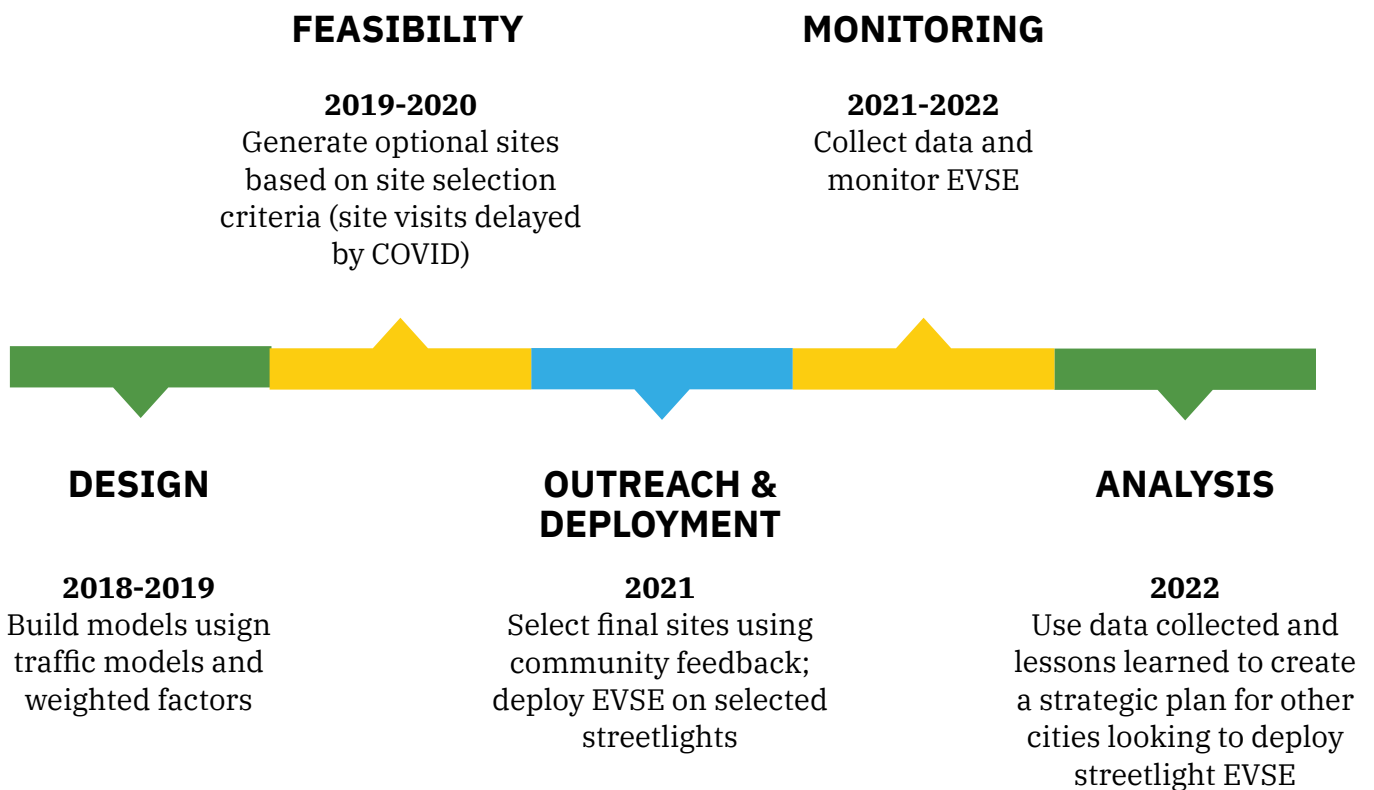
MEC is a local nonprofit dedicated to creating resource efficiency, environmental health, and economic vitality in the Kansas City region. Since 1998, MEC partnered with fleets of all types and assisted them in making the switch to cleaner, more efficient fueling. The cornerstone of MEC's clean transportation program lies in the Clean Cities program. Clean Cities is a US DOE program that "advances the nation's economic, environmental, and energy security by supporting local actions to reduce petroleum use in transportation." MEC also works in the built environment to improve energy efficiency in commercial and residential buildings. MEC's full-service program offers technical assistance, information, and education to building owners and renters with the goal to improve everyone's health and wellness.

Based on the background provided above, the objective of this work effort is to provide community outreach and engagement in Kansas City as it relates to end-user needs and stakeholder interests and concerns related to EVSE installations on public rights-of-way. Achieving this key objective entails a multipronged approach that focuses on collaboration and coordination with key stakeholders while also educating the community about electric vehicles and electric vehicle charging. Successful implementation of the objective; therefore, should establish a feedback loop that informs siting decisions regarding EVSE installations for this project now and into the future.

This project is only possible through the combined effort of all partners. MEC leads and coordinates the many phases of the project. The City of Kansas City, Missouri continues to prioritize electric vehicle charging infrastructure and sustainable transportation to make this project pertinent. Evergy is an investor-owned utility headquartered in Kansas City, MO that provides energy to KCMO customers. Black & McDonald is an integrated, multi-trade service provider that delivers construction and technical solutions for each site. Lilypad EV provides technical expertise on electric charging stations and provides equipment for the EVSE installations. The National Renewable Energy Laboratory transforms energy through research, development, commercialization and deployment of renewable energy and energy efficiency technologies to accelerate the transition of renewable energy to the marketplace. Missouri University of Science and Technology and Penn State University provide support and insight on research and data collection. Finally, Westside Housing Organization is a community development corporation focused on building resilient, sustainable communities through strong partnerships.

Project Phases and Timeline

The Kansas City Streetlight charging project is a multi-year, multi-step project that involves numerous local partners and input from organizations, academic institutions, and community-based organizations.





Engaging with Project Partners

MEC identified local Kansas City, Missouri (KCMO) partners to serve as key advisors who work collaboratively with EVNoire to develop the approach to facilitate the community listening sessions. Input and guidance from local Community Based Organization (CBO) partners are important pieces of EVNoire’s Equity framework and are critical to ensuring MEC is cognizant of the perspectives and needs of local agencies and their constituents and that the work is grounded from a community centered perspective. MEC and EVNoire engaged Westside Housing Community, a CBO “working at the intersection of home, health, energy and equity”, and other local organizations that prefer to remain unnamed. They provided feedback about the project’s community outreach and engagement strategy and informed the development of the listening session questions. They also supported recruitment efforts to encourage community participation.

EVNoire’s work included conducting community research focused on the proposed EVSE sites and compiling the findings into this comprehensive report. EVNoire is an award-winning consulting group, whose work centers on e-mobility best practices and e-mobility diversity, equity and inclusion. EVNoire advances equitable, multimodal e-mobility solutions within electric, connected, shared and autonomous vehicle technologies. They utilize this expertise, a human-centric approach and data-driven frameworks to integrate and amplify e-mobility best practices and e-mobility diversity, equity and inclusion in the transportation sector. EVNoire works with partners ranging from auto manufacturers, utilities, and government agencies, to charging network companies, non- profits, community-based organizations, and rideshare and delivery network companies.

Participant Engagement



EVNoire first presented participants a high-level overview of electrification, EV charging, and the project background before the community research began. The purpose of providing background information to participants was to **improve their understanding of the project, increase their awareness of project criteria** and to **provide key contextual information.**

They then showed participants the site location map and invited them to open up the map via a link so they could interact with it on their own devices.

Next, EVNoire guided participants through the **project criteria**, as seen in the image below. The project criteria help to inform participants on how sites were selected for the site map while also guiding their feedback. The four buckets of considerations cover the scope of factors that the project partners considered when developing the site map. Finally, they gave participants suggestions for the type of feedback that would provide the most helpful direction, in an effort to give participants a starting point for the discussion. These suggestions included:

- Voice support (or not) for proposed neighborhoods
- Suggest specific curbside charging locations in proposed neighborhoods
- Add additional Points of Interest (POIs) to the model to identify new potential neighborhoods
- Any additional ideas or suggestions that relate to the proposed charging locations or community needs



EVNoire's Equity Framework

EVNoire's Equity Framework is a **human centric, collaborative approach** that seeks to elevate the needs of community residents and partners while working synergistically with the intended audience to implement the solutions that address these needs. EVNoire first seeks to understand the landscape of the target community to better grasp what questions need to be asked, what current events/considerations are contributing to resident outcomes, and what approach would work best to conduct research. This phase of the framework mainly focuses on web-based research and analysis to compile an understanding of the community. After assessing these factors, the framework then seeks to identify organizations, leaders and stakeholders in the community that work closely within their communities and represent the voices of those within it. Centering the experiences of the community residents and partners; therefore, informs and guides the framework itself, which ensures that gathered information and provided recommendations are in line with the actual needs of the target community.

1

Conduct landscape analysis of target community

5

Provide policy, messaging & programming recommendations to stakeholders

2

Identify community-based organizations and other key stakeholders

6

Work with CBOs, professional and faith based organizations to implement solutions

3

Facilitate community-based research with target community

7

Empower and engage target community with information

4

Analyze data and refine methodological approach

8

Use metrics to assess programs/policies & create strategy for improvement

Community Background & Landscape



Overview

To understand the community in the context of electrification, it's first important to understand the factors, considerations, and background that have shaped the community landscape. In terms of charging infrastructure, these factors include things like housing ownership, poverty distribution, suburban movement, public transportation infrastructure, and micromobility transit. These considerations all highlight specific anecdotal experiences shared by participants in the listening sessions or provide context for experiences they shared.

Community at a Glance

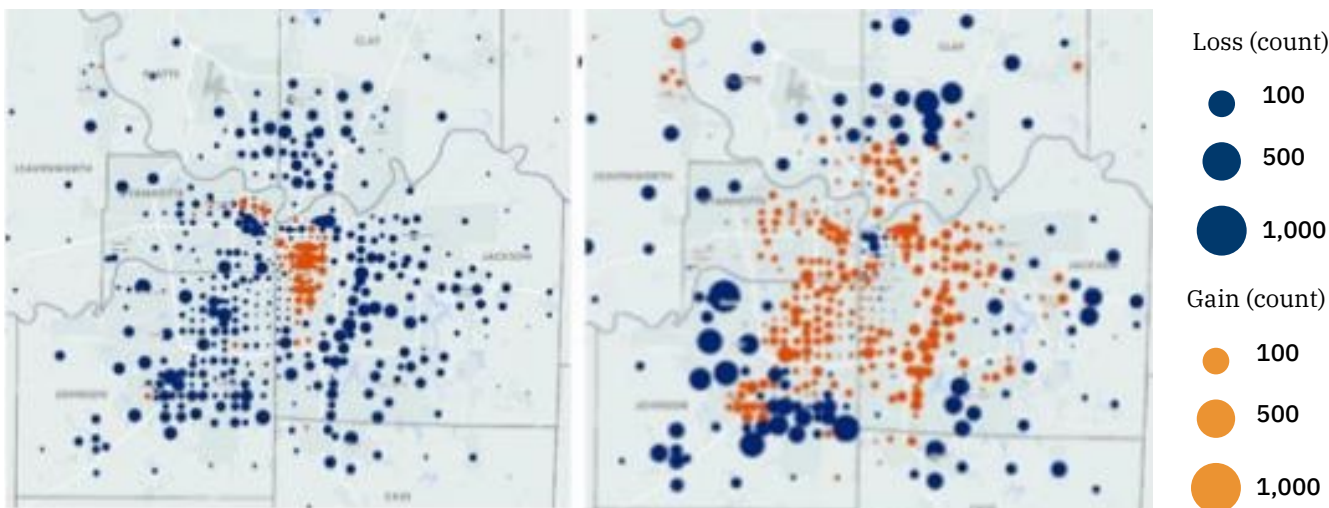


Figure 1.1a: Minority Population Change

Figure 1.1b: White Population Change

Figure 1.1: Population Change between 2000-2010 | KCMO Region

Source: Mid America Regional Council (MARC). "Fair Housing Assessment." [marc.org](https://www.marc.org/Regional-Planning/Housing/pdf/4ADemographic-Summary.aspx), November 2016, <https://www.marc.org/Regional-Planning/Housing/pdf/4ADemographic-Summary.aspx>. Accessed 9 September 2021.

Between 2000 and 2010, Kansas City experienced a suburbanization movement: White residents began to move within the Kansas City region into the suburbs, while minority populations moved into urban areas. The migration of populations into new areas represents a macro factor of today's disparities, which aggregate many micro factors - such as city planning, local investments, and redlining - to create Kansas City's current inequitable landscape.

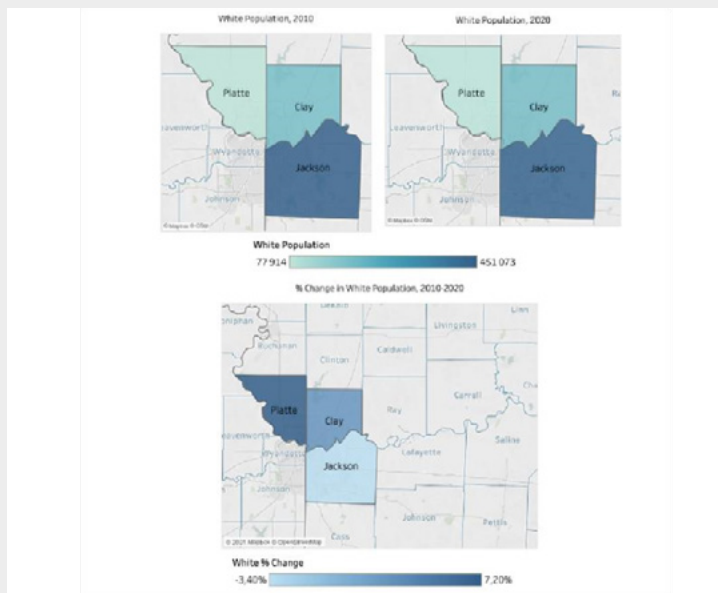


Figure 1.2a: White Population Change By KCMO County, 2010-2020

However, newly released 2020 census data illustrates a new, divergent trend. White population growth has slowed to a virtual standstill in the counties that comprise KCMO (Clay, Jackson, Platte) while minority populations are booming. In Platte and Clay counties, the minority population change between 2010 and 2020 was 70% or higher, compared to <10% for white populations.

The racial group with the biggest growth was persons identifying as two or more races, which again indicates that KCMO is becoming more diverse, with rapidly growing minority populations. These trends are not localized: the statewide white population change between 2010 and 2020 represented a loss of 218,435 white residents from the state.

Geographically speaking, the population shifts are most dramatic in counties north of the river (Clay and Platte), indicating that populations are not only changing, but also moving. These new trends in population growth will have significant impacts on KCMO and the residents that live there.

As these trends continue, Kansas City's population north of the river will require additional infrastructure and community services to support a larger population.

Communities with population decline may require support to ensure services are maintained and prevent blight. Historically, the Missouri River has been a geographic, socioeconomic, racial, and political division in Kansas City. Increased diversity on both sides of the river presents an opportunity for city leaders to unite a long-divided city through intentionally equitable and inclusive planning efforts.

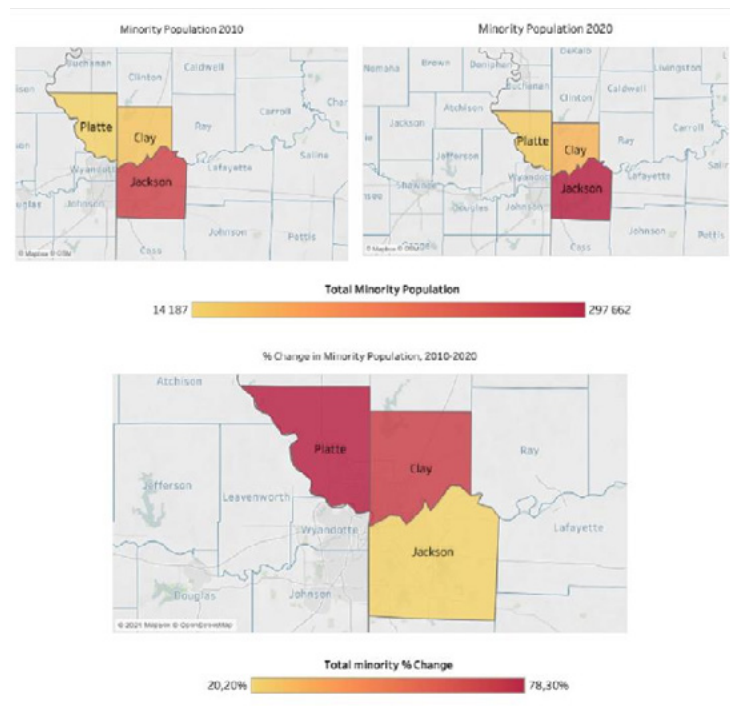


Figure 1.2b: Minority Population Change By KCMO County, 2010-2020

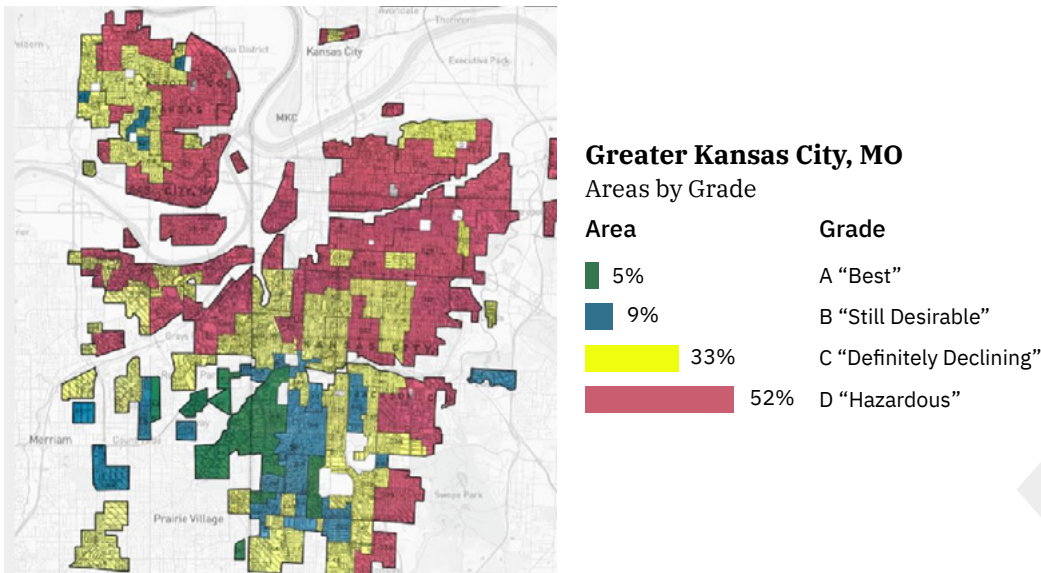
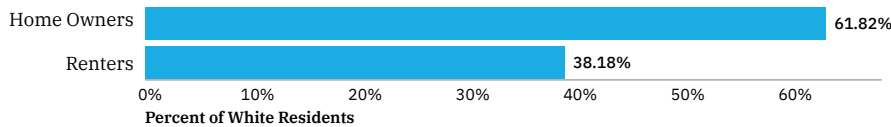


Figure 1.3: Redlining in New Deal America, Greater KCMO Region

Source: Robert K. Nelson, LaDale Winling, Richard Marciano, Nathan Connolly, et al., "Mapping Inequality," *American Panorama*, ed. Robert K. Nelson and Edward L. Ayers, accessed September 9, 2021, <https://dsl.richmond.edu/panorama/redlining/>

To illustrate how micro factors aggregate into macro events - such as migration and suburban movement - the case of redlining is examined in closer detail. Figure 1.3 represents a map of the Greater KCMO region divided into "grades" displayed in various colors. These grades were compiled from records belonging to the federal government's Home Owners' Loan Corporation (HOLC) between 1935 and 1940, and represent the institutionalization of discrimination. Areas in red were classified as undesirable due to high proportions of low-income, immigrant, and non-white residents, which led bodies like HOLC to recommend lenders refuse loans in those areas. The redlining processes that segregated the Greater KCMO region were already in motion almost a century ago, and still impact the opportunities available to residents today.

White Home Ownership



Black Home Ownership

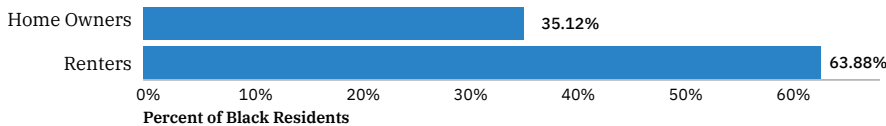


Figure 1.4: Home Ownership by Racial Identity, KCMO

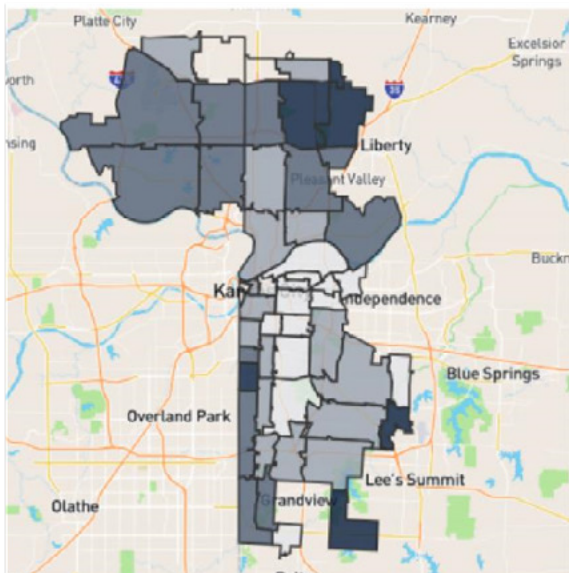
Source: US Census Bureau, *American Community Survey 5 Year Estimates*

Factors like redlining play a substantial role in disparities that currently affect minority populations. For example, home ownership for white residents in Kansas City is 61.8%, compared to only 36.1% of Black residents who report owning their homes. Suburban migrations and the subsequent disparities that emerged in the wake of this process have also shaped the distribution of resources, infrastructure, and investments in these communities, which is why it is an important piece of contextual evidence to consider in the analysis.

High Racial and Economic Segregation

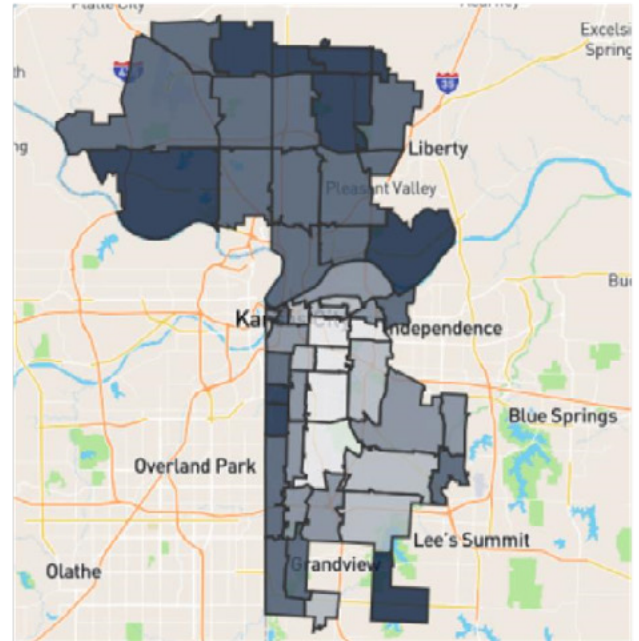


The KCMO region has long suffered from disparities in outcomes across racial and economic lines. Figures 1.5a and 1.5b illustrate how divisions of race and income have geographic dimensions as well. The darker grey areas in the racial segregation map show predominantly white areas in the suburbs (Fig. 1.5b). This correlates with income levels, which also tend to be highest in those areas (Fig. 1.5b). The continued segregation that the KCMO region faces is a real barrier to EV adoption, as multiple factors that ensure successful EV deployment rely on equitably distributed resources. This report examines how the disparities in race concentrations and income concentrations have altered the transportation landscape.



Median Household Income

| | |
|---------------|-----------------------|
| Lightest Grey | \$7,784 - \$41,078 |
| Light Grey | \$7,784 - \$65,136 |
| Medium Grey | \$65,136 - \$112,159 |
| Darkest Grey | \$112,159 - \$138,220 |



Percent of Residents who are White (non-Hispanic)

| | |
|---------------|-----------------|
| Lightest Grey | 7.14% - 27.91% |
| Light Grey | 26.92% - 45.68% |
| Medium Grey | 45.69 - 69.5% |
| Dark Grey | 69.51% - 85.52% |
| Darkest Grey | 86.53% - 100% |

Figure 1.5a: Economic Segregation in Selected KCMO Zip Codes

Source: US Census ACS 5-year 2015-2019

Figure 1.5b: Racial Segregation in Selected KCMO Zip Codes

Source: US Census ACS 5-year 2015-2019

Disparity in Micromobility Accessibility

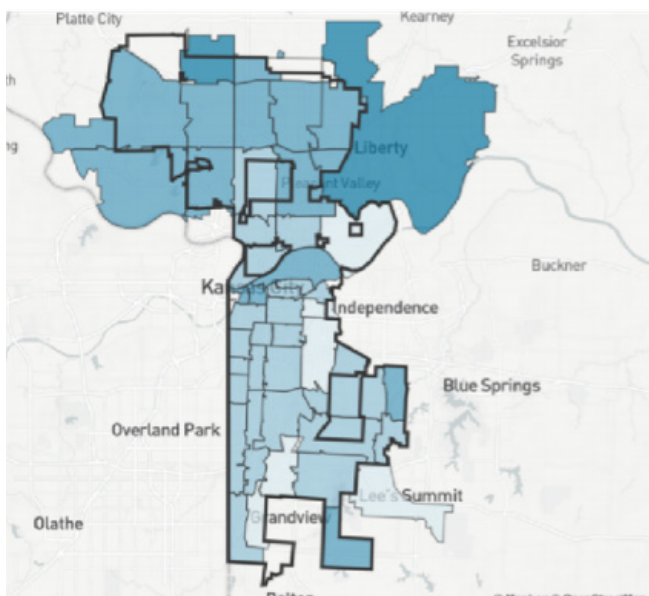


Micromobility includes a scope of transportation options that cover shorter distances, including walking, biking, and using a scooter. In a robust transportation landscape, micromobility plays an important role in resident accessibility, health, and safety. However, in the KCMO region, access to safe sidewalks - which is a key element of micromobility infrastructure - is not equitably distributed.

In the context of first/last mile gaps, which describes a situation where residents have to travel from a public transit stop (usually by foot) to their final destination or from the destination of origin to a public transit stop, inaccessible walkaways and bike paths are a serious issue.

First/last mile gaps can be especially burdensome for commuters who rely on public transit to get to their destination but must commute the “first” and “last” mile gaps on foot to complete their journeys. This added commute time can seriously disadvantage commuters and residents who rely on timely commutes for work, childcare, or educational purposes that require punctuality.

Additionally, safe sidewalks are a major consideration for residents with mobility issues and other disabilities that require even, spacious and clutter-free sidewalks for safe travel. Residents in wheelchairs or other mobility aids cannot freely move around the city if sidewalks are not properly maintained. This seriously impedes their **quality of life, mobility options and autonomy.**



Kansas City, MO

Satisfied/ Very Satisfied

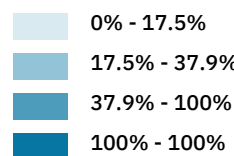


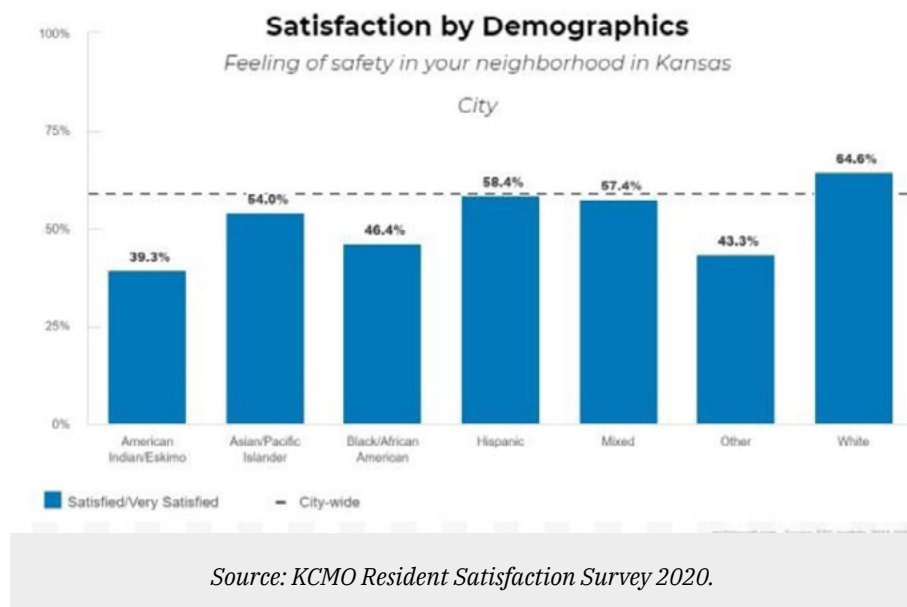
Figure 1.6: Resident Satisfaction with Sidewalks in their Neighborhood

Source: ETC Institute, 2018 - 2019

Understanding Community Intersections: Pressing Transportation Concerns

Safety

Participants shared that a pressing transportation concern was the lack of perceived safety in their communities. The concerns about safety directly impacted participants' responses about siting locations: if participants do not feel there are safe locations in the community, they will be hesitant to suggest charging station locations which require certain safety standards as a prerequisite.



Community research conducted by the City of Kansas City, MO, in an annual resident satisfaction survey, highlights many of the participants' anecdotal experiences, emphasizing the need to address this community concern. Only 34% of respondents in the city's FY18 resident survey reported feeling safe in the city, compared to neighborhood safety perceptions which were slightly higher but segmented by racial identity.

Over two-thirds of white residents reported feeling safe in their neighborhood, compared to only 46% of Black residents and 39% of Indigenous residents, suggesting that safety concerns may be more prevalent in communities of color.

“ I would say one of the most [pressing concerns] we deal with in the west side neighborhood and the Northeast - which are heavily Latinx, Hispanic and African-American communities - are the safety concerns we face. ”

-KC Community Member

Reliance on Personal Vehicles

A common theme participants shared was the significant dependence on personal vehicle use as a transportation method. Over-reliance on personal vehicles can indicate deeper institutional issues - such as insufficient micromobility infrastructure and inadequate public infrastructure - but also can go deeper to illustrate serious transportation burdens for community members. Vehicle ownership in Missouri is the 4th most expensive in the nation according to US News Today, partly due to high sales tax (\$3,118 average) and vehicle property taxes (\$1,179). It's no surprise, therefore, that Kansas City has a high rate of zero vehicle households, which are defined as households without access to personal vehicles. 7% of Missouri residents across the state do not own a vehicle, compared to 10% of KCMO residents and 21% of high risk zip codes in the city.

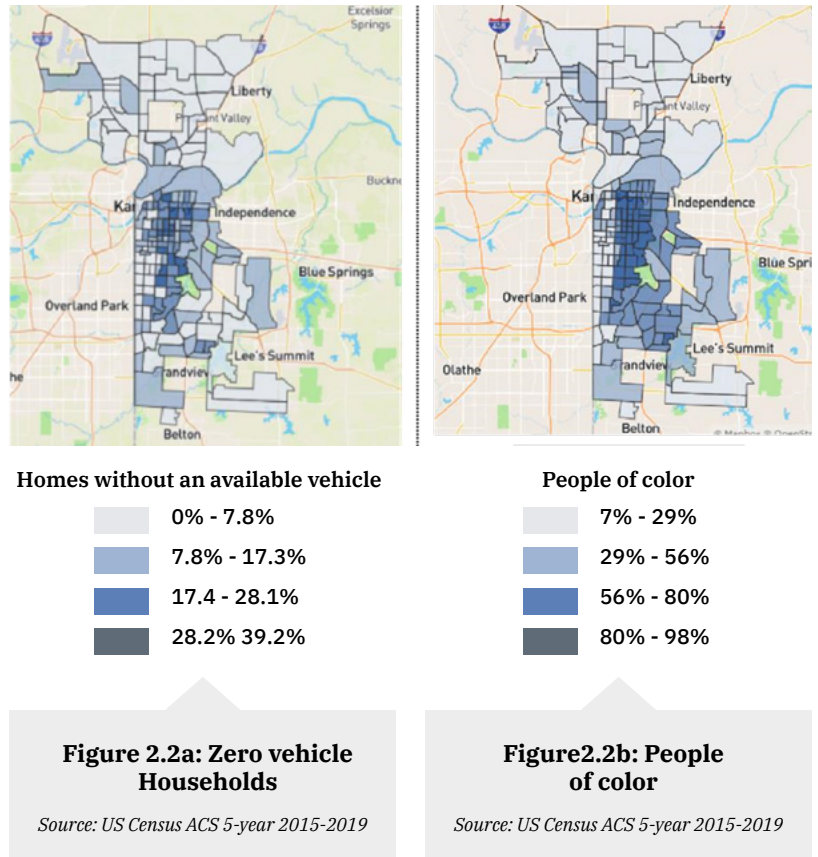


Figure 2.2a and 2.2b show a comparison between a map of zero vehicle houses and people of color in KCMO to highlight the existing disparities. For participants, the reliance on personal vehicles represented a major community barrier that prevents residents from accessing critical services like healthcare and economic opportunities such as job accessibility.

Additionally, reliance on personal vehicles presents an equity concern due to the unequal burden that transportation costs represent for low-income households. In Kansas City, transportation costs represent 21.3% of total income spent for median income households, compared to low-income households whose transportation costs represent 51.7% of total income spent. Taken together, the reliance on personal vehicles can present serious equity concerns given the existing institutional issues that are amplified for residents without access to personal vehicles.

“ I’ve noticed that a lot of our community doesn’t have access to vehicles themselves. No one really owns their vehicles. ”

-KC Community Member

Insufficient Public Infrastructure

| Service Area | Importance % | Satisfaction % |
|---------------------------------------|--------------|----------------|
| Infrastructure- streets and sidewalks | 65% | 17% |
| Police services | 46% | 55% |
| Neighborhood services | 18% | 39% |
| City water utilities | 13% | 51% |
| Public transportation | 11% | 43% |

Figure 2.3: Resident Satisfaction Survey FY2020 Kansas City MO
Source: FY2020 Resident Satisfaction Survey, Kansas City Missouri

Participants were emphatic in expressing their concerns about access to transit and other mobility options like walking, wheelchair access, and bike lanes. The disruption that the lack of sidewalk access in particular caused participants went further than just being an inconvenience: it challenged participants' ability to access other transportation (like public transit options) due to unreliable walking routes and lack of safety.

In the Resident Satisfaction Survey for FY20, Kansas City, MO, residents were asked to rank their priorities in terms of importance and satisfaction. For the most recent year, participants again cited infrastructure (streets and sidewalks) concerns as their most significant community priority by a margin of nearly 20%. However, infrastructure was conversely ranked lowest in satisfaction, indicating that Kansas City residents are most impacted by their infrastructure quality but least likely to be happy with the current status quo.

Insufficient sidewalk access is significantly related to other concerns voiced by participants: one participant shared that safety concerns were especially applicable for public transit commuters, who worried about walking in unsafe conditions to access bus stops. Safety concerns underline the accessibility of micromobility options, which then amplifies existing issues with public transit access and personal vehicle reliance. Additionally, for residents with mobility challenges the persistence of unsafe sidewalk conditions can inhibit their ability to move around without risk or even to move around at all. Continuing to address resident concerns about infrastructure is not only a community priority, but an equity priority as well.

“ The number of people I see walking in the street is pretty appalling. Either because there’s no sidewalk or there’s not an accessible sidewalk, you know, one that’s accessible to wheelchairs. ”

-KC Community Member

Insufficient Public Transportation

Given the community intersections discussed previously, insufficient public transportation options pose a serious barrier towards developing an equitable transportation landscape. The way that the community interactions tie in with each other is not only a sign of how they mutually reinforce each other, but also how they double the burden on those affected by transportation for work but cannot walk to a transit stop safely or the distance is too great, this transportation burden has a multiplier effect by impacting other aspects of the example resident’s commute. Because transportation landscapes rely on a **robust ecosystem of options**, shortcomings in one transportation mode can have carryover effects onto others.

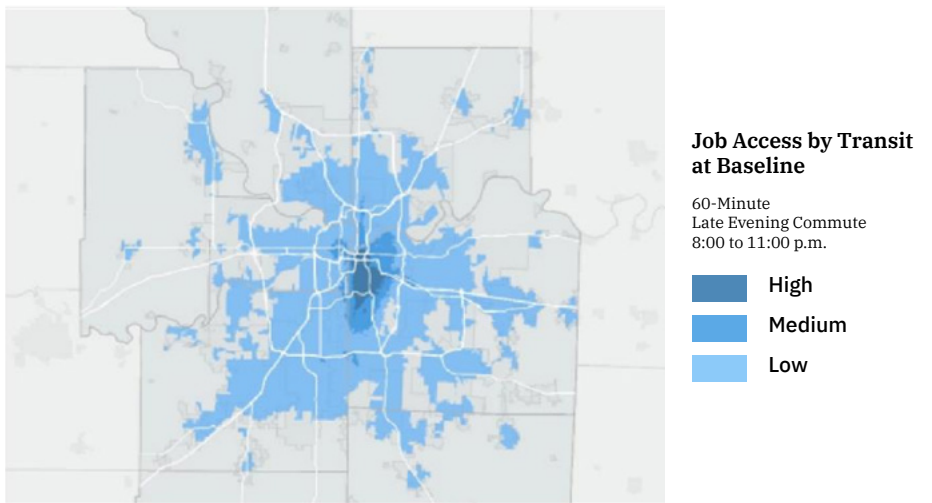


Figure 2.4: Jobs Accessible by Transit at Baseline of Smart Moves Plan

Source: Mid-America Regional Council

Additionally, public transportation coordination is hampered by the bi-state authority structure that governs the transportation landscape in both Missouri and Kansas. According to the Annual Kansas City report, the fractured funding system that the Kansas City Area Transit Authority relies on “local funding (which provides the majority of its operating revenue) that comes from only one dedicated funding source with the City of Kansas City, Missouri.” The remaining funding is a “patchwork of local service contracts from other regional municipalities supporting limited bus service in these communities.”

The report concludes by highlighting the burden that such a system causes commuters: “while workers and transit users participate in a regional job market, the system they use to reliably get them to those jobs is fractured by municipal boundaries.”

Kansas City, Missouri: Commuter Demographics

Median Earnings



Commuters Living in Poverty



Race and Ethnicity Demographics

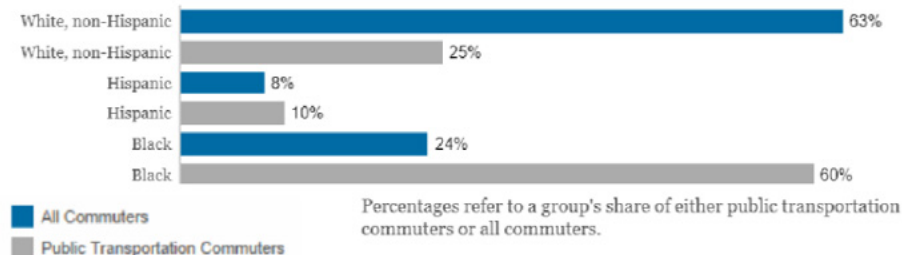


Figure 2.5: Commuter Demographics for KCMO

Figures shown are for city residents age 16 and older who commute to work. Source: U.S. Census Bureau, American Community Survey, 2010-2012 estimates

Commuter demographics for public transportation ridership strengthens the argument that insufficient public transportation is an **equity priority**. The percentage of all commuters living in poverty is 8.8%, compared to 26.9% of public transportation commuters.

Correspondingly, racial demographics for public transportation commuters slants heavily towards Black residents - 60% of public transportation ridership is Black, compared to 24% of all commuters who are Black. Conversely, 63% of all commuters are White, non-Hispanic compared to only 25% of public transportation commuters. The median earnings of public transportation commuters are half of those for all workers. These statistics serve to illustrate the disparate need between racial and income demographic groups for reliable transportation service, which is a cornerstone for economic opportunity for these communities.

“ I had looked into the timing to get to a certain location and it would take me two hours to get home from there because of the way the buses run. And there are a number of bus stops in our area, but the way they connect with other buses or other mass transit is less convenient to getting around to places. ”

-KC Community Member

Site Selection and Preferences

Participants were asked to provide feedback on the proposed charger locations after going through the project criteria and an overview of charging infrastructure. The feedback was solicited in the form of questions posed to a listening session group, which gave the experience a discussion-like quality while also gaining important insights into community thoughts around the project. The participant feedback is analyzed in depth below, organized according to the questions asked in the listening sessions.

Lack of Community-centric Spaces

Participants shared that the ideal type of location for charging infrastructure would be a community center or space where residents could spend longer amounts of time (60-90 minutes), but that such spaces were not numerous in their community or otherwise not accessible. Having diverse locations where residents can dwell, socialize, and receive support are critical parts of a well-resourced community while simultaneously being good locations for charging stations, again illustrating the intersection between charging infrastructure access and community privilege.

“ There’s no particular attraction other than our community center for people to sit for any length of time to charge up their vehicle. So that would be my concern in terms of safety and safe access to charging [while] sitting for the time. ”

-KC Community Member

The concern about lack of community-centric spaces extends past convenient longer-term parking locations; as the participant experience column identifies, safety while vehicles dwell is also an important community consideration. Participants honed in on this kind of community space because of the perceived safety in combination with the dwell time compatibility, which indicates that community residents may be especially attuned to the safety aspects of longer-term charging.

Chargers as an Economic Opportunity

Several participants shared that charger locations should go in business zones, particularly local and small businesses, who could benefit from the attraction that charging infrastructure offers. For the community, the possibility of providing a necessary service at business locations which currently are under trafficked by EV owners is an exciting prospect and one of the main features that excited participants.

In addition to the benefit that local business could reap, the additional installation, maintenance and management of charging locations opens up an opportunity for economic development as well. Evidence from KCMO's Resident Satisfaction Survey FY 2020 indicates that nonwhite residents, low-income residents, and residents of the 3rd and 5th districts are the most likely to be dissatisfied with job training opportunities that advance careers. For reference, the residents of 3rd and 5th districts are primarily Black, another indicator that the disparities in job training and opportunities fall along racial and economic lines.

“ The idea of putting them in business zones on the west side of district five, in district three, and the north part of district four, these are the three areas that have been negatively affected by white flight. ”

-KC Community Member

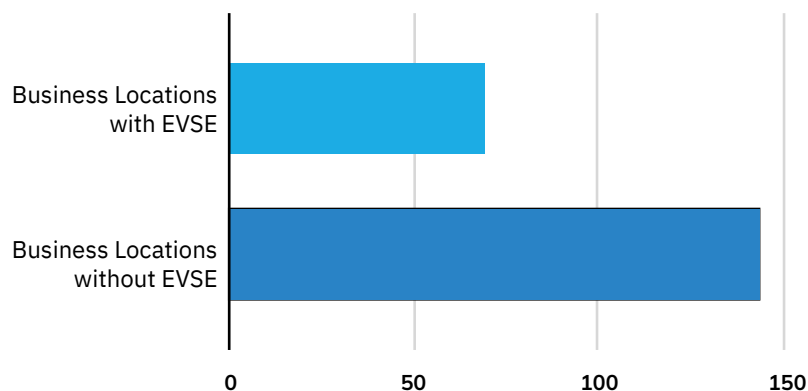


Figure 3.1: Estimated Dwell Times at Business Locations

A recent report by FLO and Utility Dive found that EVSE siting at business locations has a measurably positive impacts on consumer behaviors.

According to the report, “ shoppers will typically park and stay at a mall for about 70 minutes - which is known as dwell time” but that number more than doubled at locations where FLO installed chargers, resulting in “a dwell time (that) more than doubled for EV owners to around 144 minutes.” Figures 3.1 illustrates the impact that EVSE at business locations has on consumer dwell time to emphasize the behavioral difference that EVSE locations can invoke.

“That’s the real reason why going into identifying the business zones and going into these business establishments [is important] because this is an opportunity to get them to generate more revenue. And if those businesses in these neighborhoods are able to generate more revenue, they’re able to give more revenue back to the neighborhoods.”

- KC Community Member

Siting in Economic and Racially Exclusionary Zones

Among the locations that participants were able to view on the map, several shared that they viewed the site locations as *economically and racially exclusionary*, meaning that they are placed in zones that prioritize access for majority white, wealthy residents. The concern with placing sites in exclusionary areas is reinforcing patterns of privileged mobility. Transportation systems that create *privileged mobility* have long kept underserved populations on the margins of attainment and opportunities, so the possibility of reinforcing these systems with streetlight charging is directly opposed to the goals of this project.

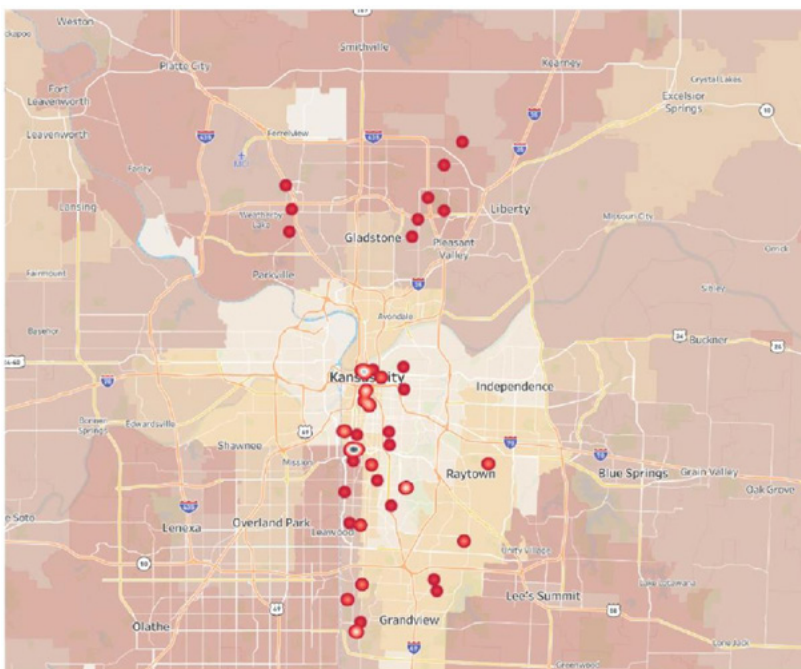


Figure 3.2: Proposed Charger Sites Overlaid w/ 2018 Median Income Data

2018 Household Income

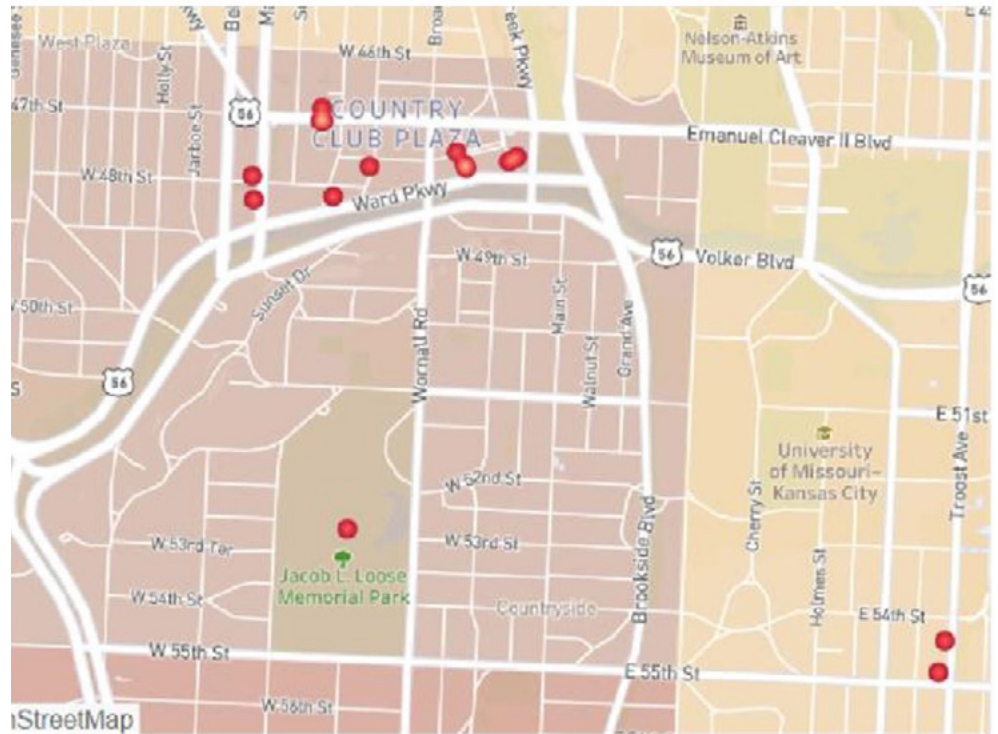
- 2,490 to 41,300
- 41,300 to 51,100
- 51,100 to 61,300
- 61,300 to 81,000
- 81,000 to 250,000

“ I was able to zoom into those locations and I will tell you, the majority of them are very gentrified. and I don't believe the inner-city community would have access to those particular locations. ”

-KC Community Member

Figure 3.2a: Closer View of Plaza Location

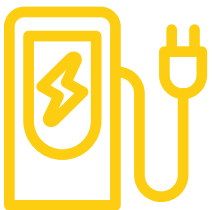
Figure 3.2 and 3.2a: are examples of an area that a participant shared to exemplify the exclusionary siting: the Plaza area, as seen in this image, is in the darker red/pink areas, indicating that these incomes are in the upper ranges (61,300-81,000). The red dots indicate proposed charger locations, visualized by their density. In the 1 mile radius of the Plaza area, there were 13 proposed sites alone.



When overlaid with the entire map of proposed locations, it

becomes clear that exclusionary locations could be a potential issue with the sites: there are distributions of chargers in lower income areas of the KCMO region, but participant feedback suggests that exclusion considerations should be taken into account for the final siting decision.

Siting Chargers Near Green Spaces



Participants were enthusiastic about charging locations near green spaces, as outdoor locations such as parks fulfill several criteria the participants were especially concerned about: safety, accessibility for the community, and sufficient dwell times. Dwell time is defined as the amount of time a vehicle spends in one location while parked. Participants mentioned locations relating to green spaces or parks **15 times**, indicating that this type of space has potential to be impactful for the community. An analysis conducted by Kansas State University affirms the idea that green spaces are an accessible option for low-income and medium income households: low-income households had access to 154 acres of park space and medium income households had access to 264 acres, compared to only 66 acres for high income groups. However, the presence of park space does not mean that its quality or resources are equal. Following the report, “low-income census tracts (CTs) contained significantly more parks, but also **had fewer parks with playgrounds and more quality concerns per park**. High minority CTs **had more parks with basketball courts, but fewer parks with trails**.” The disparity in resources and quality conditions is another indicator that these privileges are not evenly distributed in the KCMO region.

Grocery Stores And Other Convenience Locations

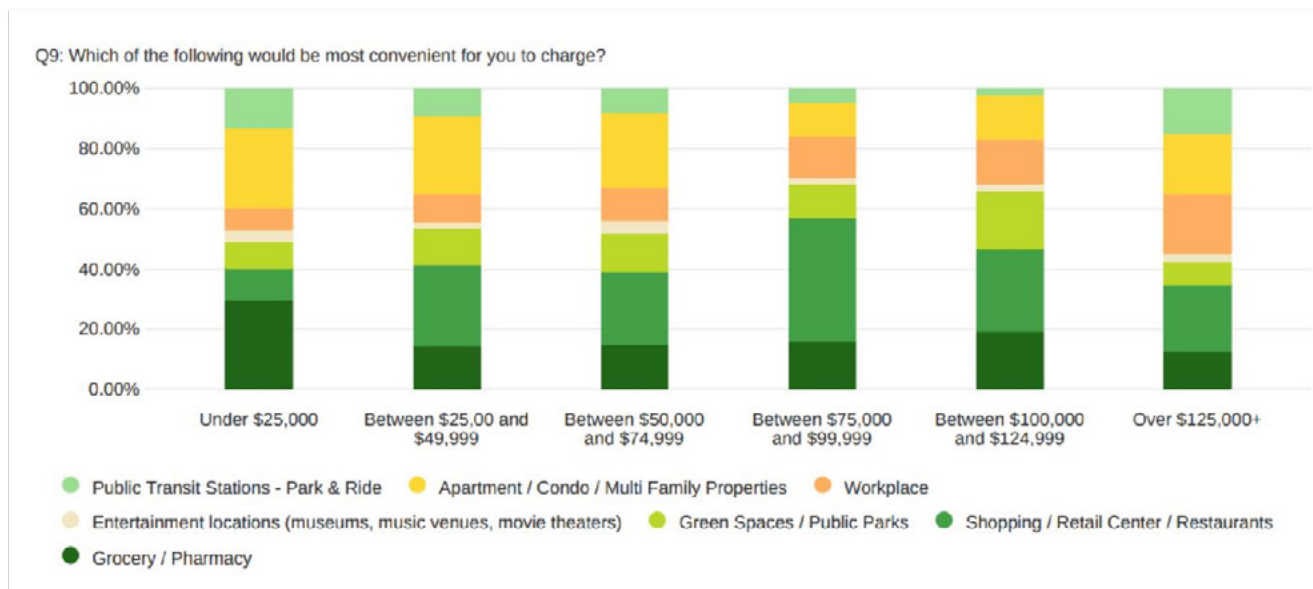


Figure 3.2: Charging station convenience by Income group

A common suggestion participants offered was to install charging locations at grocery stores or other convenience locations. The benefits of these types of sites are multifaceted. First, one participant pointed out that the employees at grocery stores are frequently members or reside within frontline communities. This means that their access to charging infrastructure and electric vehicles could be disparate compared to communities of privilege. Having charging stations at grocery stores would therefore function as workplace charging for these employees, and a convenient location for customers. Second, the dwell time at a grocery store is well suited for the type of charging infrastructure the project is targeting - Level 2.

In another study conducted by EVNoire, 512 Black participants from varying income groups, educational attainment, age groups and gender were asked survey questions on a variety of EV access indicators, including charging convenience and access. The findings indicated that there are **strong correlations between income level and charging location convenience**. Participants with incomes of 25k or less were extremely more likely to choose a grocery or pharmacy as a convenient charging location: nearly 40% of participants chose this option, compared to around 15% of respondents in the highest income category (125k+). The highest income earners instead valued charging locations at their workplace or at shopping and retail centers. Conversely, participants in the lowest income group were the least likely to choose retail or shopping locations as convenient charging locations. This indicates that greater income is correlated with more disposable income to spend at retail or shopping centers, where amenities may be more suitable for charging infrastructure. These findings highlight the fact that charging location convenience is not uniform across different income groups - and may be a valuable consideration when making siting decisions.

Community Recommendations

Additional Siting Recommendations

After an analysis of participant feedback, EVNoire developed a set of maps that paid particular attention to the types of locations participants recommended. These locations are particularly relevant to frontline communities, including low-income and communities of color. EVNoire took the following steps to develop the recommendations.

- The Missouri University of Science and Technology developed 7 sets of map layers that indicated points of interest such as restaurants, shopping centers, parks, community locations, schools and more. The map layers containing points of interest were then narrowed down to the locations that aligned with participant feedback.
- Not all of the locations included in the map layers were located in frontline communities. To establish which sites were located in frontline communities, ***the environmental justice (EJ) screener tool***, developed by the Environmental Protection Agency (EPA), was used to identify communities of higher EJ concern. The EJ screener map uses comparison data at the ***national level*** to evaluate areas of greater EJ concern.
- The environmental justice (EJ) definition used for the development of the new map was as follows:
 - ◆ Communities where ***20% or more*** of the population is ***impoverished***
 - ◆ Communities where ***30% or more*** of the population is ***Black, Indigenous, or people of color***.
- Locations that were not in EJ communities were eliminated from the community recommended map, leaving only locations that qualified or partially qualified as EJ communities. Locations that had one - but not both - of the criteria were still included to illustrate different levels of need in different communities.
- Four separate maps were extracted from the community recommended maps. These maps illustrate the four location types that participants suggested the most: ***grocery stores, educational institutions, community spaces and parks***. The maps were separated by location type for ease of viewing.
 - ◆ **The mapping dataset chosen by EVNoire has several limiting factors that the project site evaluators will take into consideration when adding indicated locations to the site selection list.**
Limitations listed below.
 - They indicate a number of locations outside of Kansas City, MO, boundaries, which cannot be considered for this project.
 - They indicate points of interest that may or may not be adjacent to streetlights along parking paths, which is a requirement of the final siting.
 - ◆ **Regardless of these limitations, the maps provide additional context and important new locations that will be compared against the technical site maps to create a final selection list.**

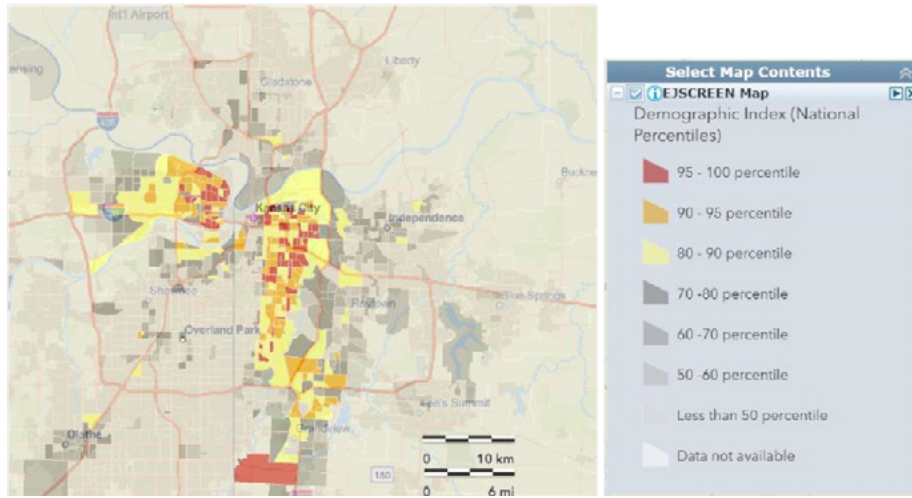
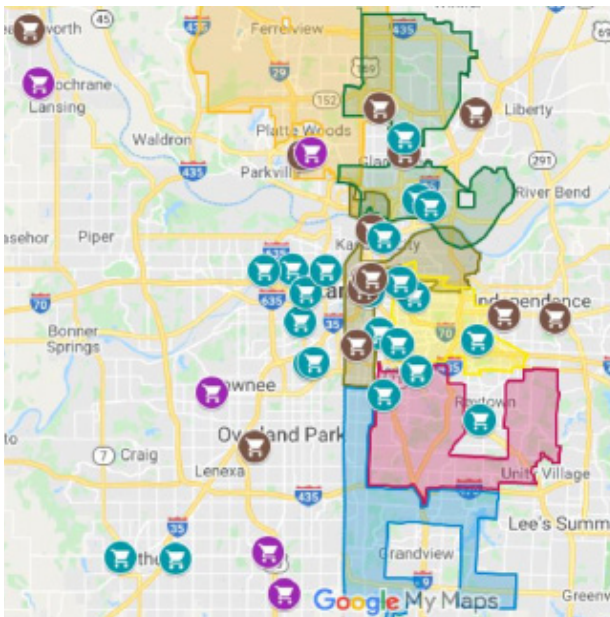


Figure 4.1: Environmental Justice Index of KCMO*

*The map displayed includes additional factors not used in the community recommendations map, including % linguistic isolation, % of population with less than a high school education, % under 5 and % over 64.

**Figure 4.2: Community Recommendations
Grocery Stores**



Site meets POC criteria: Sites highlighted in purple are in communities with $\geq 30\%$ people of color



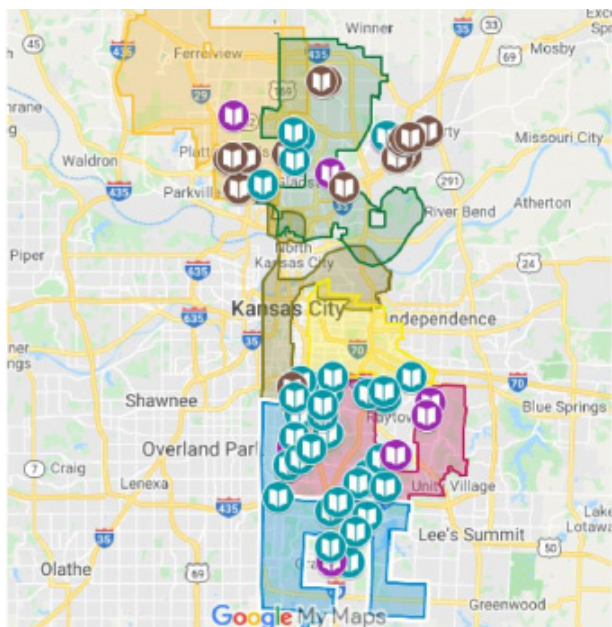
Sites meets EJ criteria: Sites highlighted in turquoise are in communities that meet both EJ criteria (% poverty and % POC)



Site meets poverty criteria: Sites highlighted in brown are in communities with $\geq 20\%$ concentration of poverty

Grocery charging locations were among the most recommended locations for charging infrastructure. Figure 4.2 illustrates possible grocery charging locations, differentiated by the environmental justice (EJ) criteria they meet. Grocery charging locations that meet EJ criteria are particularly concentrated in **Districts 1, 3, and 5**, in addition to locations **west** of District 6.

**Figure 4.3: Community Recommendations
School Locations**



Site meets POC criteria: Sites highlighted in purple are in communities with $\geq 30\%$ people of color



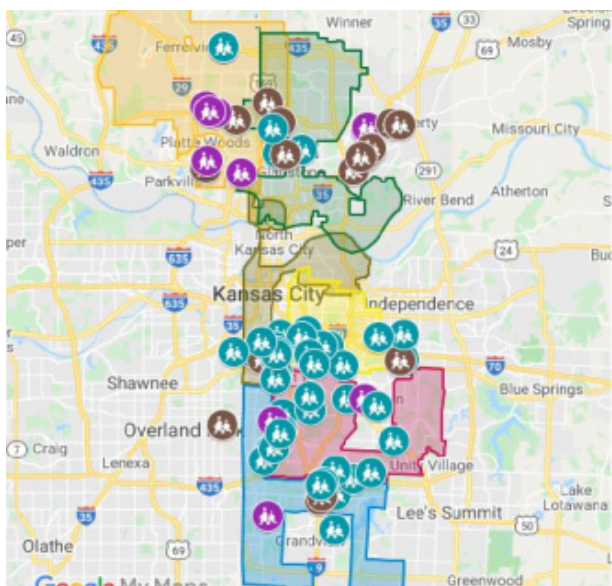
Sites meets EJ criteria: Sites highlighted in turquoise are in communities that meet both EJ criteria (% poverty and % POC)



Site meets poverty criteria: Sites highlighted in brown are in communities with $\geq 20\%$ concentration of poverty

Participants noted that schools would function as good candidates for charging stations. Figure 4.3 illustrates possible school charging locations, differentiated by the environmental justice (EJ) criteria they meet. School locations that meet EJ criteria are particularly concentrated in **Districts 1, 5 and 6**. They discussed elementary through college and thought mostly teachers would use the chargers but potentially some students would also use them.

**Figure 4.3: Community Recommendations
Community Spaces**



Site meets POC criteria: Sites highlighted in purple are in communities with $\geq 30\%$ people of color



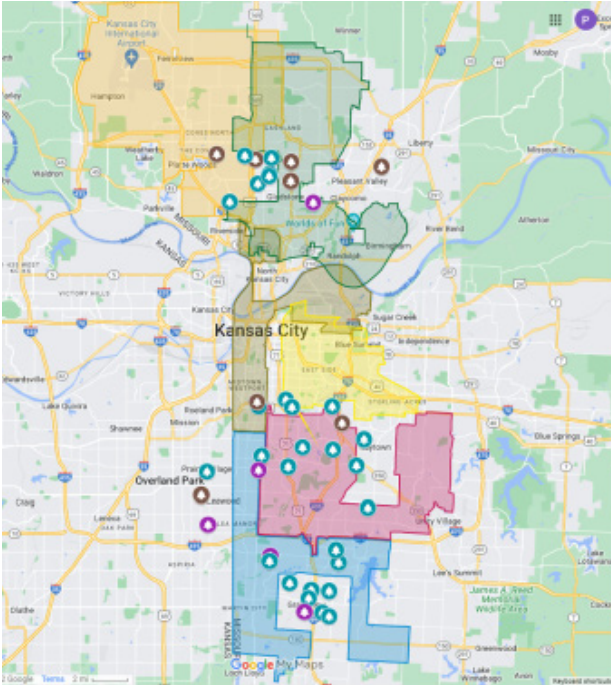
Sites meets EJ criteria: Sites highlighted in turquoise are in communities that meet both EJ criteria (% poverty and % POC)



Site meets poverty criteria: Sites highlighted in brown are in communities with $\geq 20\%$ concentration of poverty

Lack of community spaces was one of the main concerns participants brought up with the original site map. Figure 4.4 illustrates possible charging locations in community spaces differentiated by the environmental justice (EJ) criteria they meet. Community locations that meet EJ criteria are especially concentrated in **Districts 3, 4 and 5**.

Figure 4.3: Community Recommendations Green Spaces



Site meets POC criteria: Sites highlighted in purple are in communities with $\geq 30\%$ people of color



Sites meets EJ criteria: Sites highlighted in turquoise are in communities that meet both EJ criteria ($\geq 20\%$ poverty and $\geq 30\%$ POC)



Site meets poverty criteria: Sites highlighted in brown are in communities with $\geq 20\%$ concentration of poverty

Green spaces such, as parks and outdoor recreation areas, were popular recommendations from participants. These locations are conducive to level 2 charging and also provide safe locations for longer dwell times (60-90 minutes). Figure 4.5 illustrates possible charging locations in community spaces differentiated by the environmental justice (EJ) criteria they meet. Community locations that meet EJ criteria are especially concentrated in ***Districts 1, 5, and 6.***



Messaging, Marketing and Outreach

Using participant feedback, three strategies were identified as best practice approaches for organizing an outreach and engagement strategy for future marketing of the installed sites and use of EVs. The tables below summarize the findings.

| | Virtual learning Opportunities | One-on-One EV Experiences | Showcasing representative EV Drivers |
|----------------------|--|---|---|
| Participant Feedback | <p><i>"Identify some community leaders and have them reach out to the communities that they're already plugged into. I think having them speak to people they already know might be convincing [for] them to maybe adopt electric vehicles."</i></p> | <p><i>"Do not underestimate the [impact] of demonstrating [electric vehicles] ...Hype it! , do it the way that the sports do."</i></p> | <p><i>"I definitely support the virtual webinars because it's easier to capture that audiences versus physically requiring someone to go to a location. I think webinars would be optimal."</i></p> |
| Benefits | <p>Knowing an EV driver is an important part of building community awareness while also shifting the narrative around EV ownership.</p> | <p>Many experience changes in perceptions, beliefs and performances of EVs after having driven in one.</p> | <p>Virtual formats allow residents with demanding schedules or limited access to transportation the flexibility to participate when time allows.</p> |
| Reasoning | <p>Communities want to see EV drivers that look like them, are relatable and representative of their lived experiences.</p> | <p>The "see, touch, feel" experience of interacting with an EV is one of the most powerful ways to create a vertical EV market among consumers.</p> | <p>Building an EV ecosystem requires good educational foundations to be laid down, especially in communities outside of the "early adopter" profile.</p> |

Next Steps

| Continue Community work | Culturally Relevant Messengers | Culturally Relevant Messages | Develop Educational Materials | Devise roadmap of activities |
|---|---|--|---|--|
| <p>To ensure that the project meets its goals, community members should be engaged for the duration of the project and after it concludes</p> | <p>Residents want to receive information from individuals representative of their communities and who are knowledgeable about electrification</p> | <p>It's important to work with organizations and individuals that are subject matter experts and have expertise in engaging BIPOC and frontline communities to ensure that messages are conveyed effectively</p> | <p>For residents to benefit from the project, they must be familiar with the technology and its uses. Educational materials need to factor in language, literacy levels, and digital vs non digital materials</p> | <p>Engagement cannot exist in a vacuum; therefore, mapping out engagement activities is important to continuing the project's impact. Roadmap development practices to engage target community</p> |

Conclusion

At the outset of the project, EVNoire was asked to design a report that informed the decision-making process for project partners on the placement and designation of streetlight chargers. With expertise in community engagement, EVNoire conducted community research via two listening sessions where participants were encouraged to give feedback and thoughts on the site map development by the project team, and then to propose suggestions of their own. From the analysis of community research, several key themes emerged:

- **Lack of community-centric spaces:** One of the leading concerns participants shared was safety while charging an EV, especially in public spaces. For these participants, locations were determined by where they felt they could *safely* dwell, and for an overwhelming number of participants, the ideal location was therefore *community centric locations*. Placing EV chargers in community spaces can alleviate the uncertainty and fear of public EVSE charging while also positively supporting community spaces.
- **Chargers as an economic opportunity:** Many participants interpreted the charging station project as an economic opportunity for businesses in their communities who would benefit from the traffic that an EV charger could bring them. Implementing charging stations at locations *negatively impacted by white flight* was a popular suggestion and seen as a positive benefit for the business owner. Evidence from a FLO report shows that dwell times for consumers at businesses with EVSE on site are double that of businesses without EVSE, which indicates that business owners benefit from EVSE on their properties.
 - ◆ Outside of the participant feedback, ensure there are diverse charging station locations in frontline communities. This is an integral part of building a dynamic *charging network* that supports multiple economic activities, such as the gig economy and expands access to communities traditionally excluded from privileged mobility.
- **Economically and socially exclusionary sites:** Several participants viewed some of the site locations as economically and racially exclusionary, meaning they are placed in zones that prioritize access for majority white, wealthy residents. The concern with placing sites in exclusionary areas reinforces patterns of *privileged mobility*. EVNoire developed a map of median household income overlaid with charging station density and found that in a 1-mile radius around the Plaza area - which has a median household income between 61,000 and 81,000 – it showed an overconcentration of thirteen proposed charging stations.
- **Convenience locations as charging locations:** Much of the anecdotal evidence participants shared focused on the benefit of placing charging stations at convenience locations like pharmacies and grocery stores. EVNoire has conducted parallel research that indicates there is a relationship between income levels and charging location convenience.

Appendix A

Map Index:

Using participant feedback, three strategies were identified as best practice approaches for organizing an outreach and engagement strategy for future marketing of the installed sites and use of EVs. The tables below summarize the findings.

Figure 1.3a/1.3b:

- Zip codes included in map display

| | | |
|-------|-------|-------|
| 64134 | 64124 | 64109 |
| 64136 | 64125 | 64110 |
| 64137 | 64126 | 64138 |
| 64163 | 64127 | 64139 |
| 64164 | 64128 | 64145 |
| 64165 | 64129 | 64146 |
| 64166 | 64130 | 64147 |
| 64131 | 64149 | 64167 |
| 64132 | 64151 | 64192 |
| 64133 | 64152 | 64114 |
| 64116 | 64111 | 64153 |
| 64117 | 64112 | 64154 |
| 64053 | 64113 | 64155 |
| 64118 | 64101 | 64156 |
| 64119 | 64102 | 64157 |
| 64120 | 64105 | 64158 |
| 64123 | 64106 | 64161 |
| | 64108 | |

Figure 1.4, 2.1a and 2.1b:

- Census tracts included in map display

| | | |
|-------------|-------------|-------------|
| 29037060100 | 29047020201 | 29047020602 |
| 29047021204 | 29047020202 | 29047020603 |
| 29047021205 | 29047020300 | 29047020604 |
| 29047021206 | 29047020400 | 29047020901 |
| 29047021207 | 29047020500 | 29047020902 |
| 29047021208 | 29047021303 | 29095005200 |
| 29095009800 | 29047021305 | 29095005300 |
| 29095009900 | 29047021306 | 29095005400 |
| 29095010001 | 29047021307 | 29095005500 |
| 29095010002 | 29047021309 | 29095005601 |
| | 29095010103 | |

| | | |
|-------------|-------------|-------------|
| 29047021310 | 29095005602 | 29095010105 |
| 29047021803 | 29095005700 | 29095010201 |
| 29047022100 | 29095005801 | 29095010203 |
| 29047022200 | 29095006000 | 29095010204 |
| 29095000300 | 29095006100 | 29095010500 |
| 29095000600 | 29095006300 | 29095010600 |
| 29095000700 | 29095006500 | 29095010702 |
| 29095000800 | 29095006600 | 29095012802 |
| 29095000900 | 29095006700 | 29095012903 |
| 29095001000 | 29095006900 | 29095012904 |
| 29095001100 | 29095007100 | 29095012906 |
| 29095001800 | 29095007200 | 29095013003 |
| 29095001900 | 29095007300 | 29095013100 |
| 29095002000 | 29095007400 | 29095013203 |
| 29095002100 | 29095007500 | 29095013208 |
| 29095002200 | 29095007600 | 29095013210 |
| 29095002300 | 29095007700 | 29095013405 |
| 29095003400 | 29095007802 | 29095013407 |
| 29095003700 | 29095007900 | 29095013408 |
| 29095003800 | 29095008000 | 29095013504 |
| 29095004300 | 29095008100 | 29095014300 |
| 29095004400 | 29095008200 | 29095014400 |
| 29095004600 | 29095008300 | 29095015200 |
| 29095005100 | 29095008400 | 29095015300 |
| 29095005200 | 29095008500 | 29095015400 |
| 29095005300 | 29095008600 | 29095015500 |
| 29095002000 | 29095008700 | 29095015700 |
| 29095002100 | 29095008800 | 29095015800 |
| 29095002200 | 29095008900 | 29095015900 |
| 29095002300 | 29095009000 | 29095016000 |
| 29095003400 | 29095009100 | 29095016100 |
| 29095003700 | 29095009200 | 29095016200 |
| 29095003800 | 29095009300 | 29095016300 |
| 29095004300 | 29095009400 | 29095016400 |
| 29095004400 | 29095009500 | 29095016500 |
| 29095004600 | 29095009600 | 29095016600 |
| 29095005100 | 29095009700 | 29095016700 |
| 29095016800 | 29095017800 | 29165030201 |
| 29095016900 | 29095018100 | 29165030205 |
| 29095017000 | 29095980101 | 29165030207 |
| 29095017100 | 29095980802 | 29165030209 |
| 29095017200 | 29095988300 | 29165030210 |
| 29095017300 | 29165030001 | 29165030211 |
| 29095017400 | 29165030101 | 29165030307 |
| 29095017500 | 29165030102 | 29165030308 |
| 29095017600 | 29165030103 | |

Appendix B

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