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March 30, 2022

Ms. Brinda Westbrook-Sedgwick
Commission Secretary
Public Service Commission
of the District of Columbia
1325 G Street, N.W., Suite 800
Washington DC, 20005

Re: <u>Formal Case No. 1130 & 1155</u>

Dear Ms. Westbrook-Sedgwick:

Attached please find the EV Market Penetration Study provided pursuant to paragraph 64 of Order No. 19898 in the above-referenced dockets.

Please feel free to contact me if you have any questions regarding this matter.

Sincerely,

/s/ *Dennis P. Jamouneau*

Dennis P. Jamouneau

Enclosures

cc: All Parties of Record

District of Columbia Electric Vehicle Market Penetration Study

Gaps Assessment of EV Charging Stations in Washington, DC

24 March 2022

The business of sustainability

ERM

Document title	District of Columbia Electric Vehicle Market Penetration Study
Document subtitle	Gaps Assessment of EV Charging Stations in Washington, DC
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Author	Grace Van Horn, Luke Hellgren, Rebecca Schloemann
Client Name	Pepco DC

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Acronyms and Abbreviations

ACS	American Community Survey
AFDC	Alternative Fuels Data Center
BEV	Battery electric vehicle
DCFC	Direct current fast charger
DMV	Department of Motor Vehicles
EV	Electric vehicle
EVCS	Electric vehicle charging station
FHWA	Federal Highway Administration
L2	Level 2
MUD	Multi-unit dwelling
POC	People of color
PHEV	Plug-in hybrid electric vehicle

1. EXECUTIVE SUMMARY

The DC EV Market Penetration Study has been developed in fulfillment of the DC Public Service Commission's directive that Pepco develop a detailed study of electric vehicle (EV) and electric vehicle charging station (EVCS) market penetration within the District of Columbia. This study was developed by Pepco and ERM to inform the Commission's understanding of the "effectiveness of the competitive" market in meeting the District's market demand for EV charging infrastructure.

ERM conducted the study as a review of all EV registrations as of January 2022 and all known EVCS in operation in the District as of March 2022. To ascertain where there may be gaps in the competitive market's efficacy in meeting demand, ERM drew upon demographic information, traffic studies, and zoning information to evaluate the correlation between multiple factors and the presence or lack of EVs and appropriate charging infrastructure. ERM conducted spatial analysis to develop a series of maps illustrating EV and EVCS market penetration and to visualize the gaps analysis.

Key Findings

- Areas of lower EV registration ("gaps") are concentrated in Wards 7 and 8, and to a lesser extent Ward 5.[1]
- Gaps in EV registration are much more pronounced in areas with lower median income, higher percent people of color (POC), and higher percent of multi-unit dwellings (MUDs).
- Gaps in charging infrastructure are slightly more evenly distributed across the District, though a pattern is visible in which downtown commercial areas and southwest waterfront communities have lower prevalence of gaps.
- Gaps in EVCS locations are less pronounced with regard to demographics. Nearly all of the areas with the largest Level 2 (L2) gaps are in areas with higher-than-average percent POC and lower than average median incomes. In general, there are fewer gaps of L2 chargers in areas with higher percentages of MUDs.
- Gaps in DCFC do not show clear demographic patterns, perhaps because there are a limited number of DCFC locations within and in close proximity to the District.

This study does not indicate or assess causation between the demographic variables and gaps in EVs and EVCS, merely correlation. However, this study can be used as a starting point for an assessment of the overall equity of EV and EVCS distribution, as well as to identify possible programmatic adjustments or approaches that could be useful given the specifics of these gap areas.

[1] For the purposes of this analysis, 2021 Ward boundaries were used.

2. BACKGROUND

In 2017, the District of Columbia (DC) established a goal of achieving carbon neutrality by 2050.[2] Reducing emissions from transportation, which account for nearly a quarter of greenhouse gas emissions in DC, is critical to helping the District achieve its carbon neutrality goal. In addition to achieving greenhouse gas reductions, the District also aims to improve accessibility, reliability, health outcomes, and greater equity with respect to transportation. To achieve these goals, the District recognizes that "subsidizing access to electric transit vehicles and supporting the growth of an electric vehicle charging infrastructure" will accelerate the process and has been pursuing initiatives that support these outcomes.[3]

In 2019, the DC Public Service Commission (DCPSC) approved in part Pepco's application for approval of its Transportation Electrification (TE) Program. DCPSC allowed Pepco to deploy infrastructure to support public electric vehicle (EV) charging stations and thereby support the competitive market and the District's plans for expanding EV infrastructure to meet climate change commitments.[4] In Order No. 19898, Paragraph 64, DCPSC directed Pepco to provide the Commission with a "detailed EV Market Penetration Study analyzing the distribution of registered EVs by Ward and the deployment of public EVCS by Ward, so the Commission can assess the effectiveness of the competitive market at serving all parts of the District relative to market demand."[5] To meet this directive, Pepco contracted ERM to develop this EV Market Penetration Study.

The DC EV Market Penetration Study is a baseline market study measuring existing EV and public electric vehicle charging stations (EVCS) and identifying gaps in and potential drivers of existing deployment. ERM used spatial analysis to create a database of public EVCS and registered EVs in the District, analyzed at the census block group level and aggregated to the Ward level. ERM overlayed the EV and EVCS data with block group data from the U.S. Census to further assess the correlation between EV ownership and EVCS development and key demographic and socioeconomic factors, such as race, income, home and vehicle ownership, and population density.

ERM worked closely with Pepco to identify data needs, review the inputs to the spatial analysis, and assess the key gaps and data patterns identified through the spatial analysis.

3. METHODOLOGY

In developing the DC EV Market Penetration Study, ERM relied on multiple public databases from federal and local agencies, including the U.S. Census Bureau, the U.S. Department of Transportation, the U.S. Department of Energy, and the DC Zoning Office, as wells as private vehicle registration data from the DC Department of Motor Vehicles. To the extent possible, ERM used the most recently available data with the necessary granularity to allow for evaluation of the EV market and EVCS infrastructure at the block group and Ward levels. This section summarizes the data collection process and ERM's methodology for calculating critical metrics related to daytime population density and traffic and details ERMs methodology for conducting a gaps analysis on EVs and EVCS in the District.

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[2] Executive Office of the Mayor of D.C. 2017. "Mayor Bowser Commits to Make Washington, DC Carbon-Neutral and Climate Resilient by 2050." Available at: https://mayor.dc.gov/release/mayor-bowser-commits-make-washington-dc-carbon-neutral-and-climate-resilient-2050

[3] D.C. Department of Energy and Environment. *Carbon Free DC by 2050.* Available at: https://storymaps.arcgis.com/stories/034104405ef9462f8e02a49f2bd84fd9

[4] Public Service Commission of the District of Columbia. 2019. "The District Moves Forward with EV Adoption." Available at https://dcpsc.org/Newsroom/HotTopics/Grid-Modernization/Transportation-Electrification.aspx

[5] Public Service Commission of the District of Columbia. (2019). Order No. 19898. Available at https://edocket.dcpsc.org/apis/api/filing/download?attachId=84361&guidFileName=c302b307-c4b3-40e3-bf2e-3c8d9e064e64.pdf

3.1 Data Collection and Metrics Calculation

3.1.1 Demographic Information

The ERM project team (herein "project team") utilized demographic data from the American Community Survey (ACS) to analyze correlation between factors such as population density, race, income, and other relevant factors with EV ownership and EVCS locations. The ACS 5-Year Data featuring demographic data for 2015-2019 was released in December 2020 and is the most recent source of detailed data at the resolution necessary for this study.[6] The table below summarizes the many datasets used to inform this study.

Table 1: Demographic Data by Block Group Used in Study[7]

ACS Table ID	Title	Category	Description
B19001	Annual Household Income (In 2019 Inflation-Adjusted Dollars)[8]	Income	Tiered data containing number of households within 16 income brackets
B19013	Annual Median Household Income (In 2019 Inflation-Adjusted Dollars)[9]	Income	Median household income
B01003	Total Population	Population	Total population
B25033	Total Population in Occupied Housing Units by Tenure by Units in Structure	Population	Total population segmented by population of residents in owner occupied housing or renter occupied housing, and housing type (single-family, multifamily, etc.)
B02001	Race	Race	Total population by race
B25044	Tenure by Vehicles Available	Vehicle	Number of owner-occupied and renter-occupied households by number of vehicles (1-5+) available.

The project team mapped the ACS demographic data for DC. Figure 1 illustrates a selection of the demographic data underlying the analysis of this report. Additional detail on the how the project team used demographic data to assess potential gaps in EVs and EVCS coverage is covered in Sections 3.2.1 and 3.2.2 respectively.

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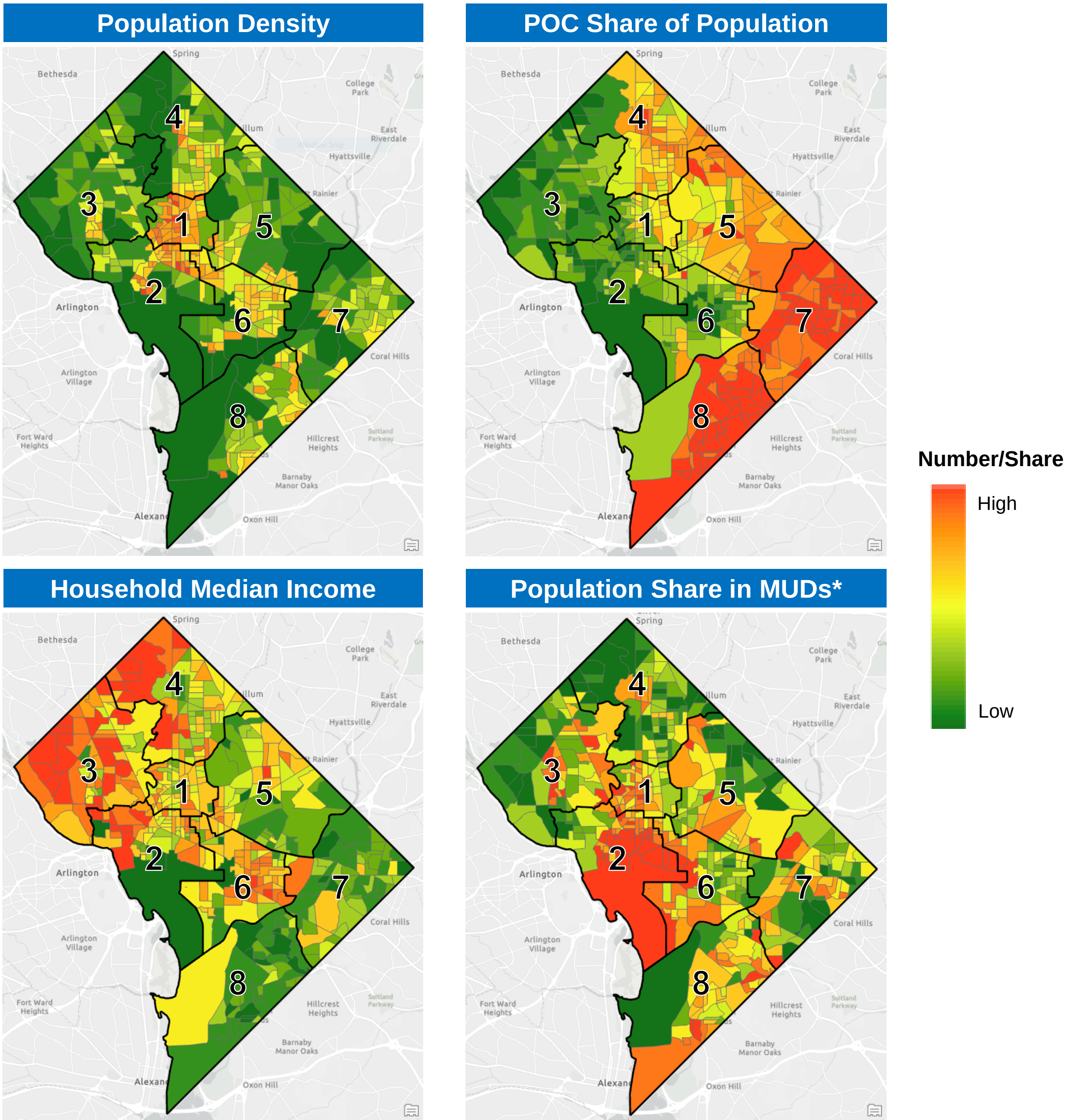
6 Detailed data from the 2020 U.S. Census at the resolution necessary for this study is not yet available.

7 U.S. Census Bureau. (2020). ACS 5-Year Estimates Detailed Tables. Retrieved from https://data.census.gov/cedsci/

8 This data set was used to supplement median household income data due to gaps in information.

9 18 of DC's 450 block groups (4%) did not have a median income reported in the ACS. For these block groups, ERM used ACS data on frequency of households in one of 16 income brackets to estimate a median income by identifying the median income bracket and assigning the midpoint of that bracket.

Figure 1: Maps of DC Demographic Data



* Multi-unit dwellings

3.1.2 Vehicle Ownership

The project team estimated the total number of vehicles in Washington, DC using American Community Survey (ACS) 2019 vehicle availability data for Washington, DC at the block group level.[10] This dataset provided estimates of the number of vehicles (1, 2, 3, 4, or 5 or more) available to homeowner and renter households in each block group. The project team calculated the number of vehicles available to

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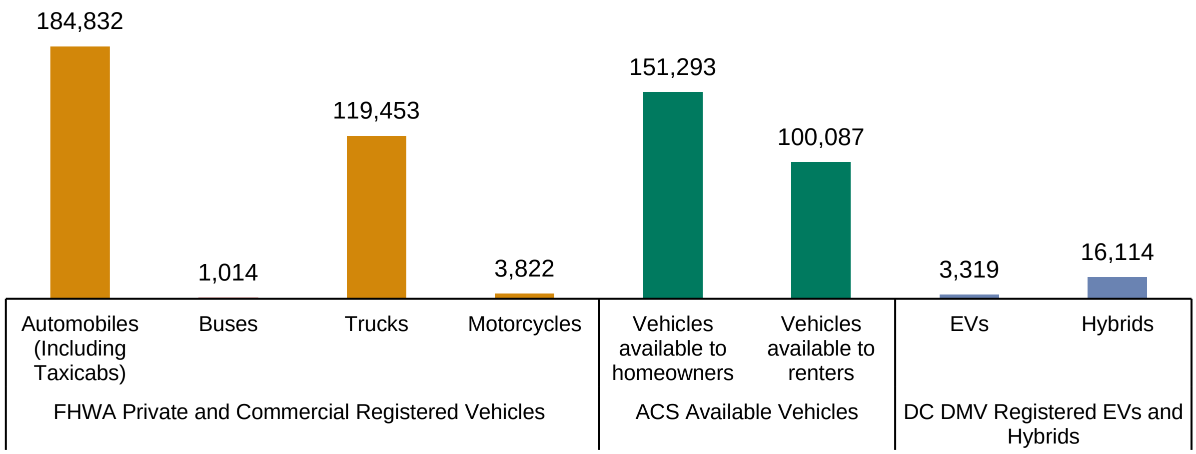
[10] U.S. Census Bureau. (2020). ACS 5-Year Estimates Detailed Tables [Tenure by Vehicles Available]. Retrieved from https://data.census.gov/cedsci/table?q=vehicle&text=vehicle&g=0400000US11%241500000&y=2019&tid=ACSDT5Y2019.B25044

homeowners as 151,293 and the number of vehicles available to renters as 100,087, suggesting that there were approximately 250,000 vehicles available to DC residents. This total estimate was cross-checked with publicly available data from the U.S. Federal Highway Administration on total motor-vehicle registrations in DC in 2019, which showed approximately 300,000 private and commercial vehicle registrations in DC.[11] The difference is likely due to gaps in census coverage and the lower representation of commercial vehicles in the ACS survey, particularly medium- and heavy-duty trucks, which are included in the FHWA data. Because this study required the ability to map the vehicle population at the block group and ward levels, the ACS data was considered the best resource.

To accurately identify the quantity and general locations of EVs in Washington, DC, the project team relied on EV and hybrid registration from the DC Department of Motor Vehicles (DMV). The data provide vehicle make, model, year, and registered address for all EVs and hybrid vehicles registered in the District. Pepco requests registration records from the DMV for its quarterly reports to the Commission, which began in July 2020. For this assessment, the project team used vehicle registrations as of January 2022 for the primary analysis.

Figure 2 below compares the FHWA total private and commercial vehicle registrations, the DMV EV and hybrid registration totals, and the total available vehicles estimated using the ACS block group data.

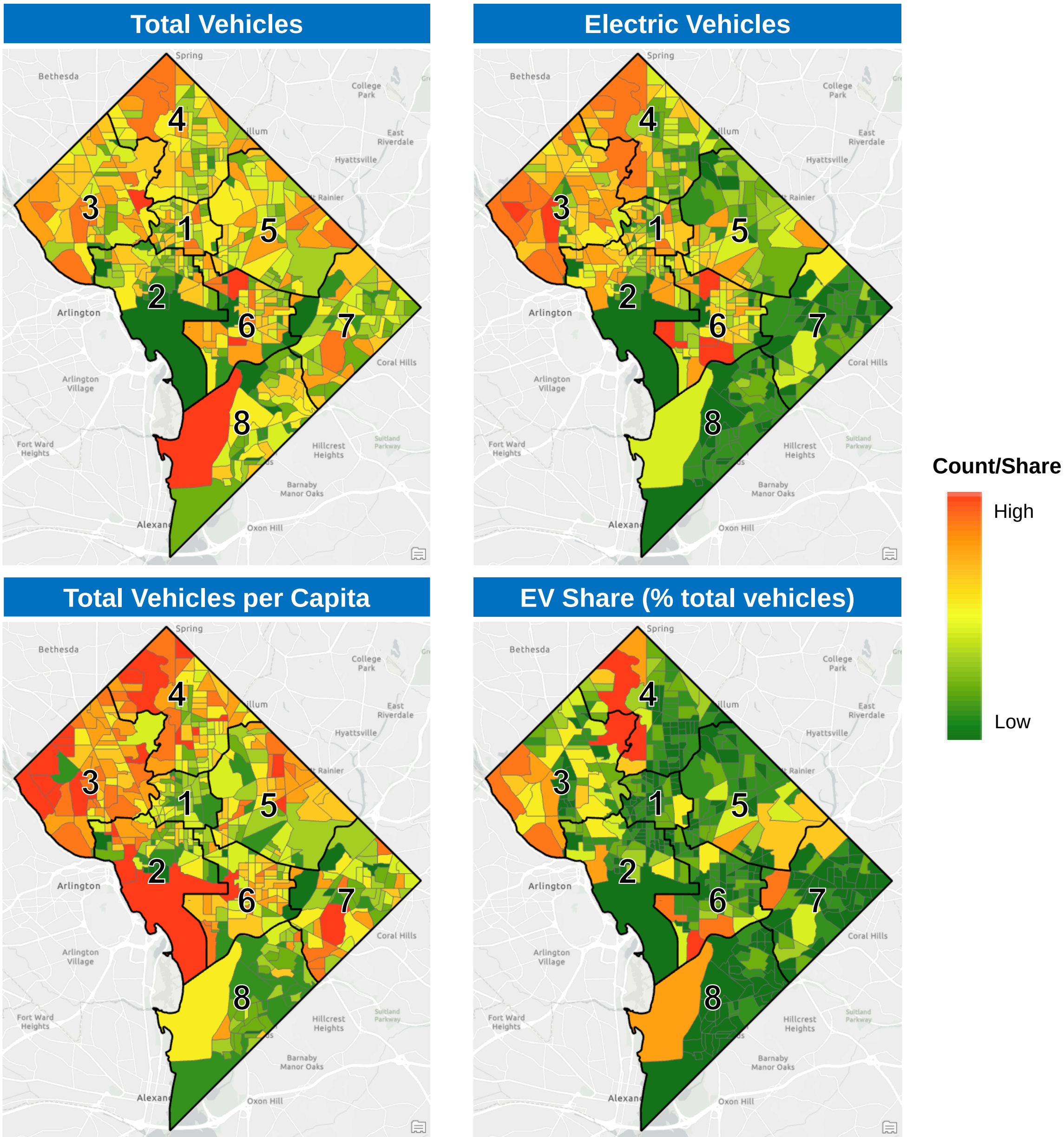
Figure 2: Comparison of Vehicle Registration Estimates in DC[6]



The project team geocoded and mapped the distribution of vehicles in DC in ArcGIS. Figure 3 below shows total vehicles and total vehicles per capita at the block group level compared to total EVs registered in the District as of January 2022, including both plug-in hybrid electric vehicles (PHEVs) and battery electric vehicles (BEVs). EV market penetration (% of total vehicles) was estimated by the project team and ranged from 0% to 8.3% at the block group level.

[11] U.S. Federal Highway Administration. (2020). Highways Statistics Series: 2019 [Table MV-1 – Highways Statistics 2019]. Retrieved from https://www.fhwa.dot.gov/policyinformation/statistics/2019/mv1.cfm. FHWA designation of "trucks" includes medium- and heavy-duty trucks (single-unit and combination), which may be one factor in the discrepancy between FHWA registrations and ACS available vehicle estimates.

Figure 3: Maps of Vehicles in DC and EV Penetration



Additional detail on the how the project team used demographic data to assess potential gaps in EV market penetration is covered in Section 3.2.1.

3.1.3 Daytime Population Density and Zoning

In addition to the baseline residential population density described above, the project team developed a daytime population estimate to account for the significant shifts in total and locational population across the District throughout a typical business day.[12] Because drivers are likely to charge where they spend their days in addition to near their homes, it is important to account for daytime population shifts in

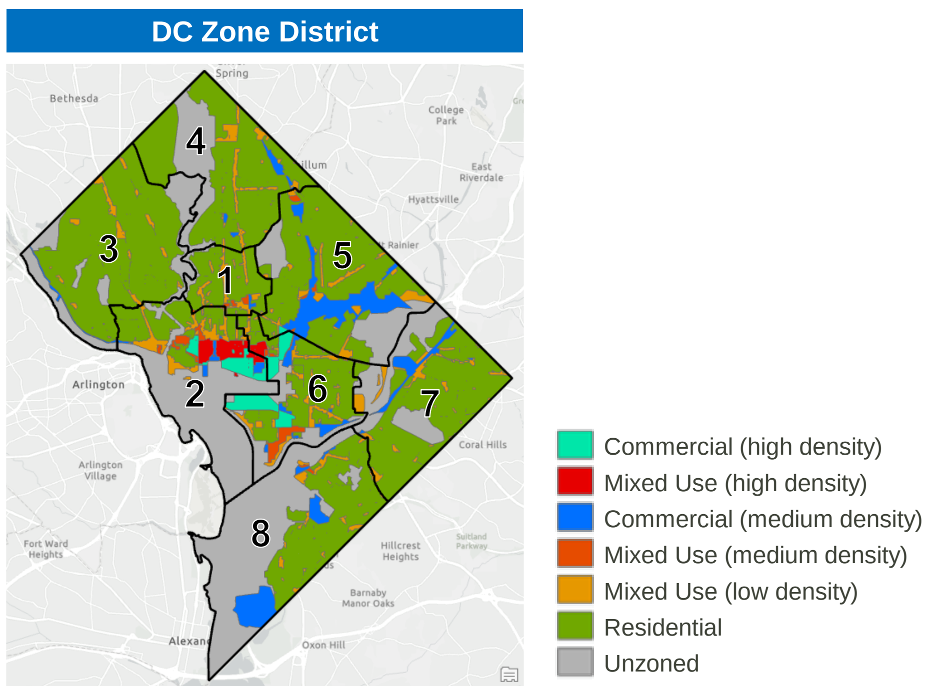
[12] For example, the U.S. Census Bureau determined that the daytime population of the District increases by 79% on a typical workday. U.S. Census Bureau,. Characteristics of Daytime Urban Commuters for 20 U.S. Cities: Gender, Work, and Family. Available at https://www.census.gov/content/dam/Census/library/working-papers/2015/demo/2015-Laughlin-01-Abstract.pdf.

analyzing the distribution of EVCS. Prior to the COVID-19 pandemic, some downtown areas of the District would experience a nearly 30 fold increase in daytime population compared to reported residential population, due to the large commuter population. During the first year of the COVID-19 pandemic, daytime population notably dropped in the downtown areas—the DowntownDC BID reported that daytime population averaged just 22% of pre-pandemic levels during the period from March 2020 to February 2021.[13] Data on daytime population at present was not publicly available to the project team; however, the project team did endeavor to account for the decrease in daytime population relative to pre-pandemic levels. See Section 3.2.2.

The project team used zoning data to assist in analyzing daytime population density, particularly in downtown and commercial areas where residential (or nighttime) population is typically much lower than daytime population. Zoning data was collected from the DC Office of Zoning's Official Zoning Map, which displays the boundaries of the Zoning Regulations of 2016.[14] In 2016, DC zoning regulations were updated after a comprehensive review of zoning regulation that had been in place since 1958. The new zoning regulations include 164 unique categories, including 63 "special purpose" zones, with a mix of downtown, mixed-use, residential, and commercial designations.

For this study, the project team developed an internal convention for categorizing each zoning label according to expected scale of non-residential use. Population adjustment factors were applied across zones to reflect a daytime population consistent with findings of the U.S. Census Bureau commuter-adjusted population study,[15] with the most significant daytime population growth expected in downtown/high density areas. Zoning districts were summarized using allowable development density and use-type designations and are visualized in Figure 4: High density (commercial and mixed use); Medium density (commercial and mixed use); Residential; and Unzoned.

Figure 4: Simplified DC Zoning Map



[13] DowntownDC Business Improvement District (BID). (2021). *2020 State of Downtown Report*. Available at https://www.downtowndc.org/report/2020-state-of-downtown-report/

[14] DC Office of Zoning. Official Zoning Map. Available at https://maps.dcoz.dc.gov/.

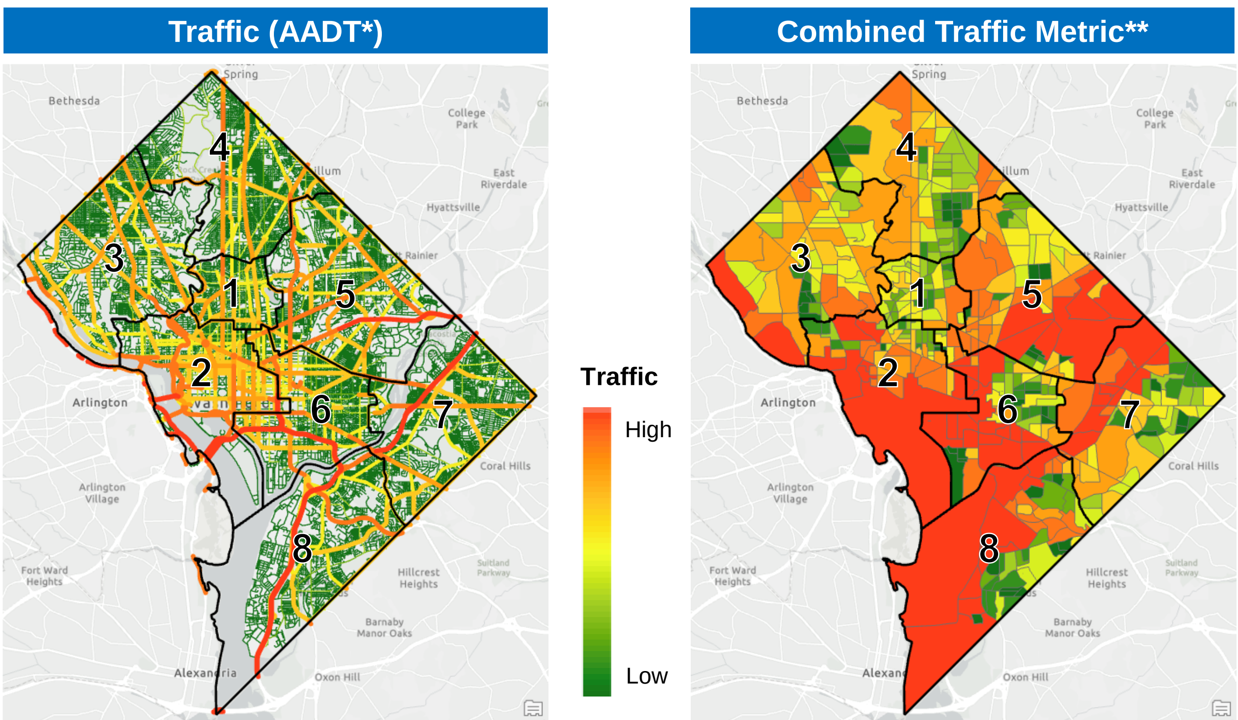
[15] Laughlin et al. (2015). U.S. Census Bureau. "Characteristics of Daytime Urban Commuters for 20 U.S. Cities: Gender, Work, and Family." Available at https://www.census.gov/content/dam/Census/library/working-papers/2015/demo/2015-Laughlin-01-Abstract.pdf

3.1.4 Traffic Data

The project team also quantified traffic in the District by developing a spatial traffic inventory using a combination of FHWA resources. Traffic is a primary indicator of EVCS demand and is an important consideration in determining the expected locations of current and future charging infrastructure.

Data from the Highway Performance Monitoring System (HPMS)[16] were first utilized for total[17] roadway traffic (annual average daily traffic, or AADT) along non-local roadways (interstates, arterials, and collectors). Total roadway traffic of local roadways (e.g., residential) was then estimated using vehicle-miles traveled and roadway length data from FHWA Highway Statistics.[18] Additional FHWA data related to the District's distribution of vehicle-miles traveled – broken down by vehicle and roadway type – were incorporated to calculate total light duty vehicle traffic along all roadways in the District. This dataset was then used to create a combined traffic metric for each tract block group that accounts for 1) acute demand, or the maximum light duty vehicle AADT of a roadway within or near[19] a block group, and 2) cumulative travel, or total light duty vehicle-miles traveled (VMT) within or near a block group.

Figure 5: Maps of DC Traffic Data



* Annual average daily traffic

** Accounts for maximum roadway AADT and vehicle miles traveled (VMT) near and within block groups

[16] U.S. Department of Transportation (DOT), Office of Highway Policy Information (OHPI). Highway Performance Monitoring System. Available at https://www.fhwa.dot.gov/policyinformation/hpms.cfm.

[17] Total traffic and vehicle-miles traveled (VMT) correspond with all vehicles traveling along roadways or near/through block groups and are not specific to vehicles registered within any specific area.

[18] U.S. DOT, OHPI. Highway Statistics Series. Available at https://www.fhwa.dot.gov/policyinformation/statistics.cfm.

[19] To account for roadways that are not technically within the boundary of a block group but are relevant to local area traffic, traffic data associated with roadways within 100 meters of a block group's boundary are included in a block group's metric calculation.

3.1.5 Electric Vehicle Charging Stations

The project team collected data on the type and location of EVCS within and near the District from the Alternative Fuels Data Center (AFDC) maintained by the U.S. Department of Energy.[20] The AFDC provides information of alternative fuel stations throughout the U.S. and parts of Canada, including EVCS.

The project team used AFDC data to identify all active and publicly accessible[21] level 2 (L2) and direct current fast charging (DCFC) EVCS located within the District and neighboring communities in Virginia and Maryland.[22] For this study the following data was used for each EVCS: location, type of charging port, number of charging ports, and charging network.

Figure 6 depicts the locations and available ports at L2 EVCS and DCFC in the DC metro area. In total, there were 249 public EVCS locations[23] within the District as of March 6, 2022; 242 L2-only charging stations, 6 DCFC-only stations, and only 2 stations with both L2 and DCFC charging ports. The accessibility of existing EVCS infrastructure is discussed further in Section 4.

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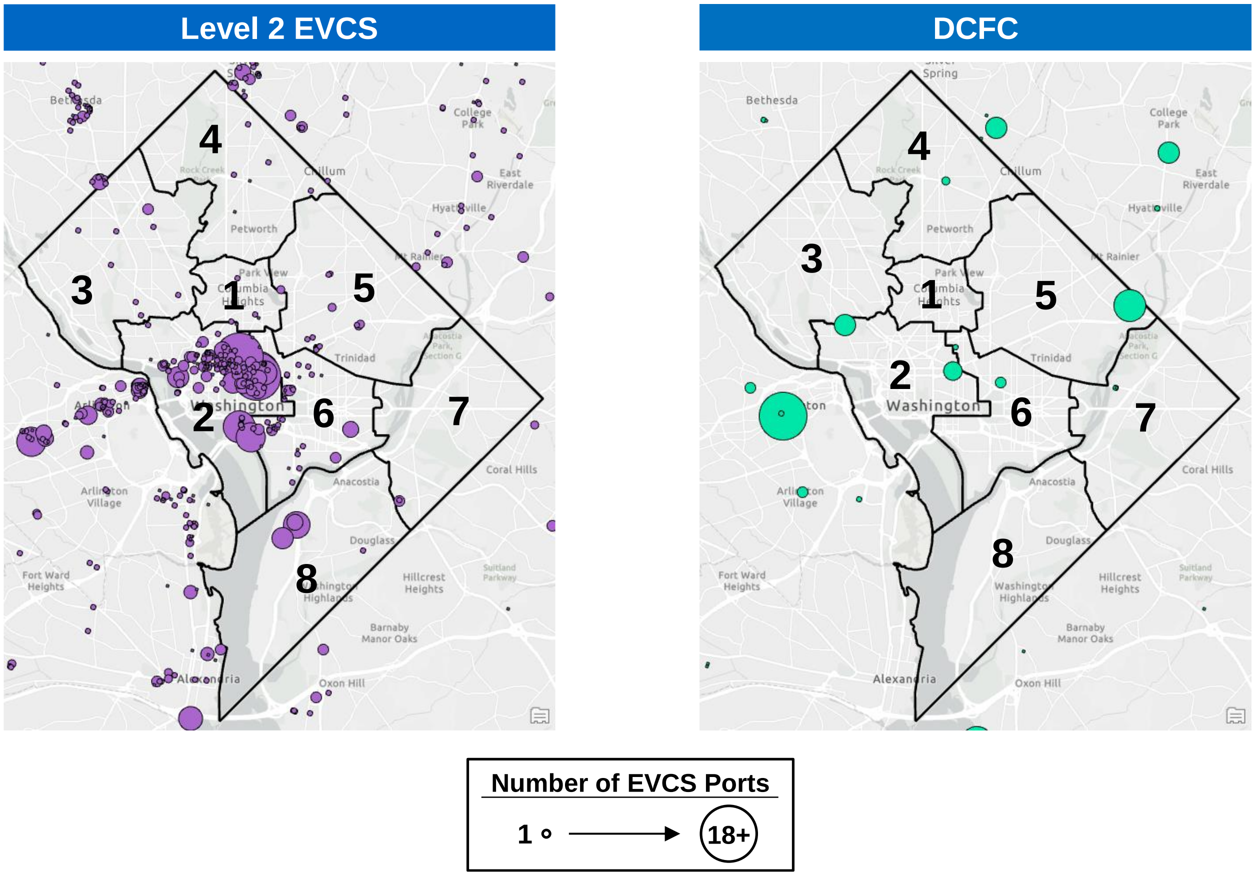
[20] U.S. Department of Energy. Alternative Fuels Data Center (AFDC). Data accessed March 6, 2022. Available at: https://afdc.energy.gov/fuels/electricity_locations.html#/find/nearest?fuel=ELEC

[21] For the purposes of this study, an EVCS is considered "public" if the general public is able to access the charging station, regardless of port type or network. Although some Tesla stations are not immediately interoperable with non-Tesla vehicles, those stations are considered public for the purposes of this report, for two reasons. First, some Tesla Destination (level 2) stations include SAE charging ports (interoperable with non-Tesla electric vehicles); in addition, Tesla ports are interoperable with non-Tesla vehicles with an appropriate adaptor. Second, the vast majority of registered EVs in the District are, in fact, Teslas, and therefore to most District EV drivers these stations are accessible: 71% of EV registrations in DC as of January 2022 are Tesla models. In comparison, only 17% of EVCS in DC (43 stations) are part of the Tesla network. Of those 43 stations, just two offer DCFC ports. The remainder are L2 using either SAE or Tesla connectors, which can be used by anyone with an adaptor.

[22] To account for nearby charging infrastructure not technically within the District but relevant to charging for the local population, EVCS within five miles of DC borders were included in the proximity analysis.

[23] This study does not cover private charging stations in DC that may only be available to specific individuals (e.g. workplace charging stations and multi-family housing charging stations).

Figure 6: L2 and DCFC Charging Stations in the DC Metro Area



Most EVCS in the District are networked[24] – as of March 6, 2022, the AFDC reported only 6 non-networked public charging stations, representing just 31 charging ports (29 L2 and 2 DCFC). Table 2 provides a breakdown of the charging networks represented in DC.

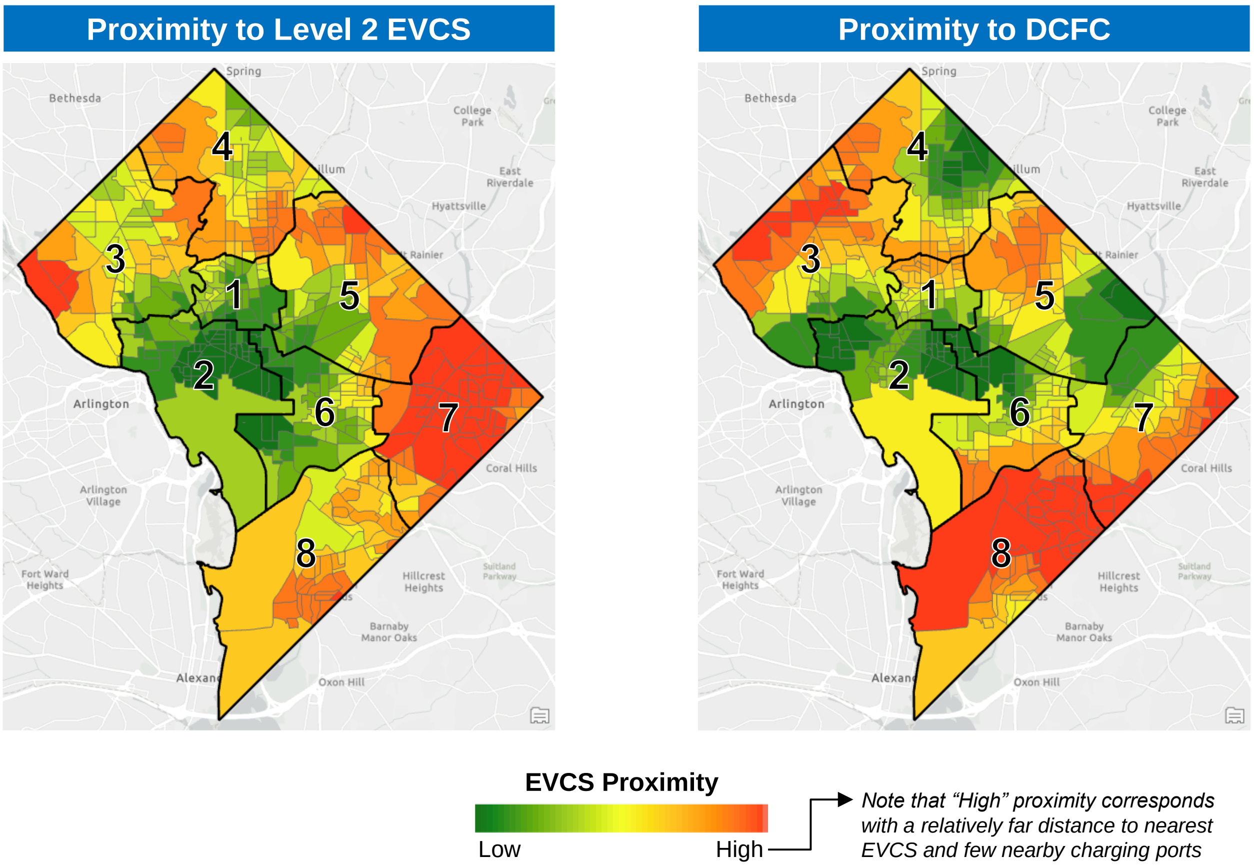
Table 2: EVCS Charging Stations within DC, by charging network and number of EVCS Ports

Charging Network	# of EVCS	# of L2 Ports	# of DCFC Ports
ChargePoint	96	177	1
SemaCharge	68	230	0
Tesla	43	132	20
Blink	16	23	0
Volta	7	16	0
EV Connect	6	11	0
EVgo	3	1	13
OpConnect	3	20	0
Electrify America	1	1	3
Non-Networked	*29*	*2*	*6*
Total	**249**	**640**	**39**

[24] Networked charging infrastructure is connected to the internet and send data, such as information on frequency of use, to a network services provider (i.e., charging network) and the site host. Non-networked charging infrastructure is not associated with any charging network. U.S. Department of Energy. Alternative Fuels Data Center. "Charging Infrastructure Procurement and Installation." Available at https://afdc.energy.gov/fuels/electricity_infrastructure_development.html

The location and density of these EVCS were then utilized to create proximity metrics for both Level 2 EVCS and DCFC. These metrics indicate areas that are both relatively far from existing charging stations and do not have many nearby ports; block group-level proximity metrics are shown in Figure 7.

Figure 7. EVCS Proximity Metrics



3.2 Gap Analysis Methodology

ERM developed an approach to quantify and apply several variables assumed to impact EV and EVCS distribution to identify potential gaps in EV ownership and EVCS deployment across the District. This approach was based on simplified assumptions regarding where one may expect EVs and EVCS to be across the District based on variables such as traffic, population, and vehicle ownership. ERM did not account for specific demographic considerations in this analysis; instead, these variables were considered as potential drivers of gaps and are explored further in the Gap Assessment section below.

A series of specific variables were first identified as key drivers for deployment of EVs and EVCS (individually; see below for more detail) and quantified/aggregated at the census tract block group level. Subsequently, all variable data were assigned percentile values to enable the combination and overlay of variables. For the purposes of this simplified approach, it was assumed that these were the only variables that would impact EV or EVCS deployment. Potential gaps in EV ownership were identified by looking at relevant variables independently; for EVCS, these variables were weighted and combined to estimate the relative demand for charging infrastructure. Ultimately, block groups with the highest values of applicable variables would be expected to have the highest EV ownership or EVSE demand.

3.2.1 EV Gaps

For the purposes of this simplified analysis, total vehicle registrations and population were considered when identifying potential gaps in EV registrations. In other words, areas with low EV penetration (percent share of total vehicle registrations) and/or low EVs per capita were determined to indicate gaps in EV ownership.

- Vehicle Registrations: areas with higher total vehicle registrations would be expected to have higher EV registrations compared to areas with lower vehicle registrations.
- Population Density: areas with a higher concentration of residents would be expected to have higher EV registrations compared to areas with lower concentrations of residents.

3.2.2 EVCS Gaps

To identify potential gaps in EVCS deployment, relevant variables were weighted and combined to create a single value to reflect the expected EVCS associated with each block group. The relationship between the variable and expected EVCS deployment was simplified as the following function:

$$\text{Expected EVCS} = 1 - (\sum \text{weighted variables})$$

where a weighted variable summation of 1 corresponds with the block group expected to have the highest EVCS deployment. See below for the variables utilized for EVCS.

Actual EVCS deployment (i.e., distance to nearest station, number of nearby ports) for each block group was also calculated and similarly assigned percentile values; in this case, a value of 1 corresponds with the most significant infrastructure gap, independent of variables. Finally, the difference between Expected and Actual EVCS was calculated for each point; block groups with the largest deviation between values – in particular, the block groups with much higher Actual EVCS relative to Expected EVCS – were identified as the areas with the most unexpected gaps in charging infrastructure.

For the purposes of this simplified analysis, the factors that were considered for where EVCS would be expected across the District were vehicle registrations, population (adjusted with zoning information), and traffic volume. However, because Level 2 EVCS and DCFC deployment are impacted by these variables differently, some of these variables were quantified separately for each type of EVCS:

- Vehicle Registrations: A higher concentration of all vehicles is likely to correspond with a higher concentration of EVs, and therefore a higher need for charging infrastructure
- Population: As EV penetration increases, some individuals who do not currently have registered cars may choose to purchase EVs and require local charging infrastructure. This could occur as the total cost of ownership of an EV falls significantly lower than that of a conventional vehicle, or other District initiatives are successful in improving access to mobility and e-mobility. Accounting for overall population, not just car registration, takes this factor into account.
- Zoning Information: The population of the District increases significantly (nearly doubling under pre-pandemic commuting patterns) during the day.[25] However, this increase is not spread equally across all areas of the District, with Downtown and high density development zones experiencing a more significant increase. The project team accounts for zoning and the associated shift in daytime population – and likely vehicle location and charging demand – by creating a composite population distribution that effectively averages residential (unadjusted or "nighttime") population with the estimated daytime population, which was calculated to reflect findings from U.S. Census

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[25] Laughlin et al. (2015). U.S. Census Bureau. "Characteristics of Daytime Urban Commuters for 20 U.S. Cities: Gender, Work, and Family." Available at https://www.census.gov/content/dam/Census/library/working-papers/2015/demo/2015-Laughlin-01-Abstract.pdf

Bureau and BID studies (i.e., 79% increase in total population, factor of ~30 increase in Downtown population, etc.). Ultimately, a daytime population around 40% higher than the unadjusted/nighttime population was referenced for analysis.

- Traffic Volume:[26] Roadway traffic corresponds with demand and is a major indicator in determining where charging infrastructure may be needed.

For both Level 2 EVCS and DCFC, these variables were assumed to equally[27] impact areas of Expected EVCS; consequently, variables were uniformly weighted (33% each) and summed to create a single value for each block group.

[26] DCFC traffic volume variable incorporates maximum roadway traffic (annual average daily traffic, or AADT) and total vehicle-miles traveled (VMT) in and around (within 100 meters) of block groups; Level 2 traffic volume variable only considers VMT

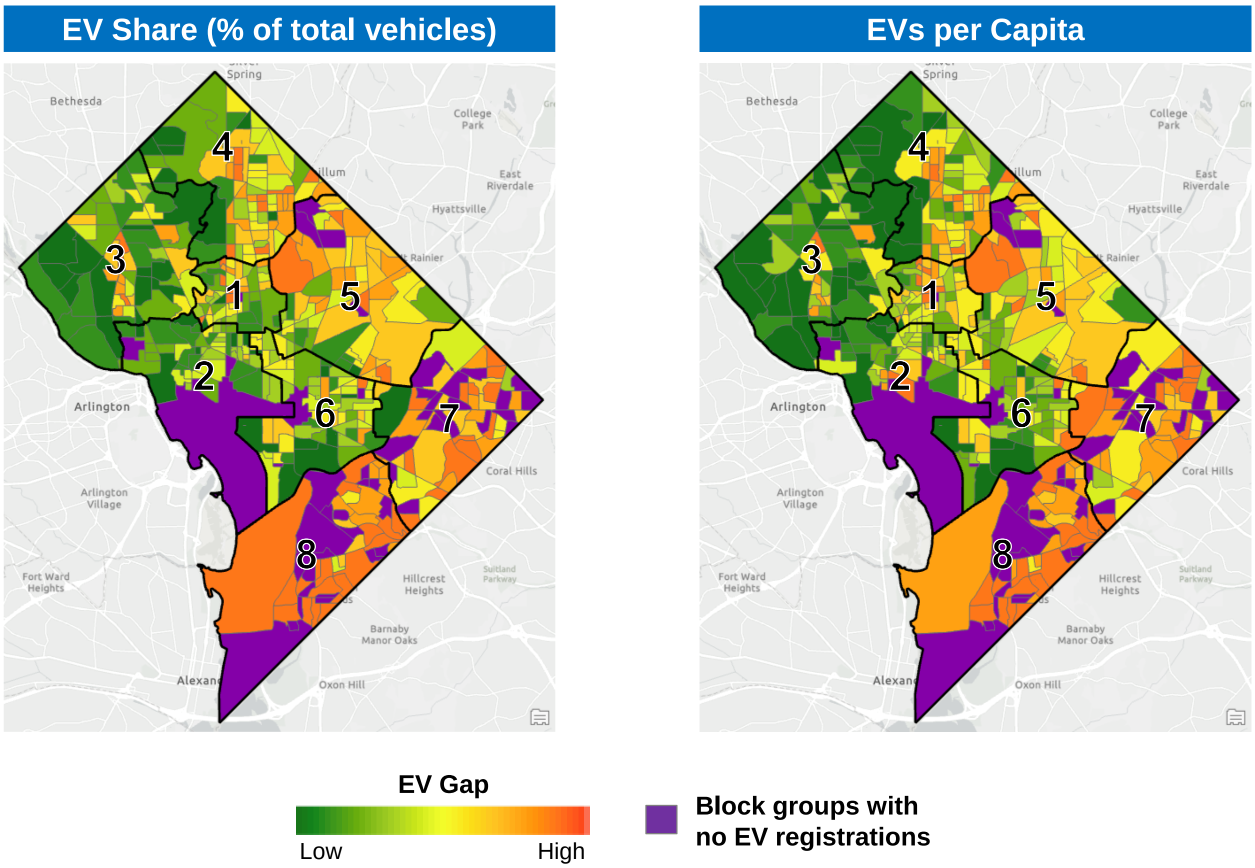
[27] This evaluation does not attempt to indicate the relative importance of variables nor is it meant to be viewed as a "suitability analysis," in which factors may be weighted differently and subjectively to produce results relevant for future EVCS development.

4. GAP ASSESSMENT AND DISCUSSION

Using the methodology described in Section 3.2, ERM identified gaps in the distribution of EV penetration and EVCS deployment. These results are shown in Figure 8 and Figure 9

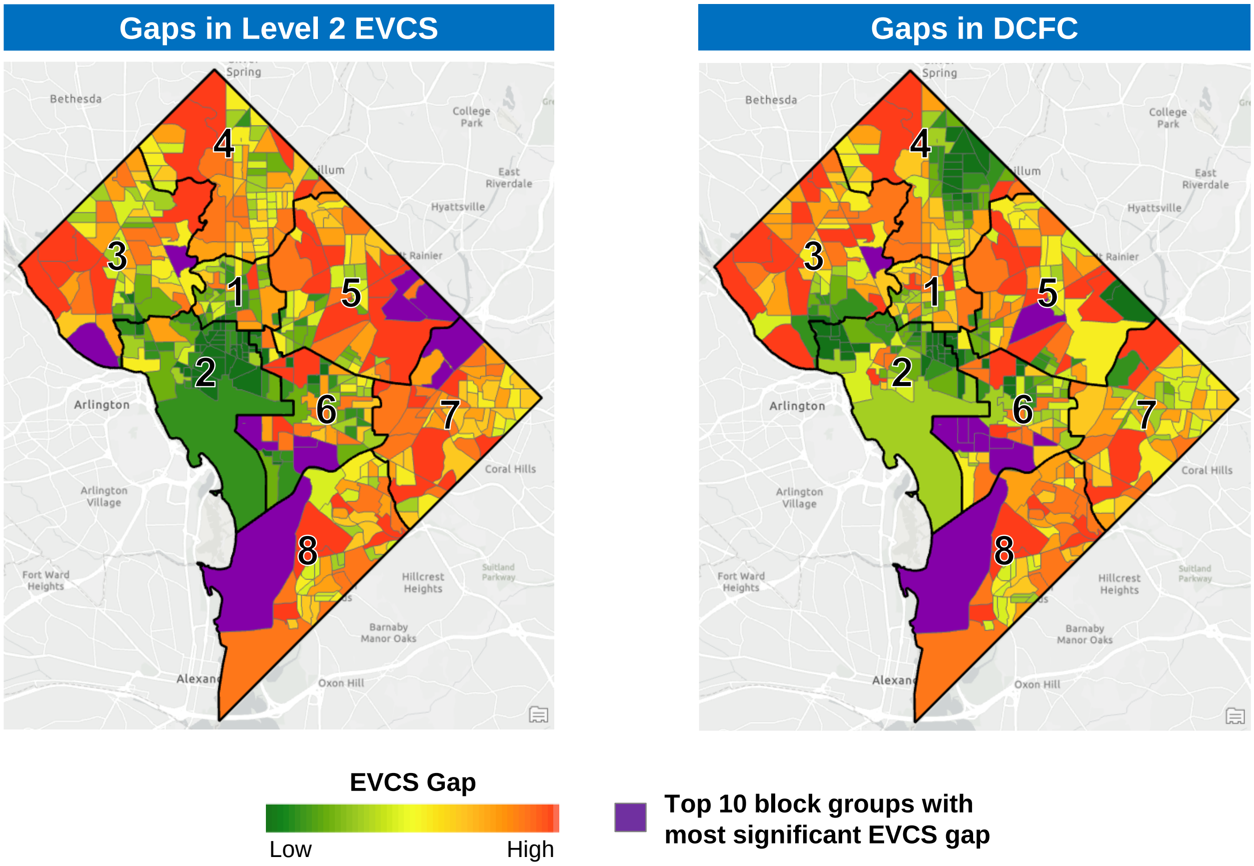
For EVs, areas that are highlighted purple are the largest gaps, as these block groups have no EV registrations. For the remaining block groups, areas with larger gaps compared to expected EV registrations (based on total vehicle registrations, left, and population, right) are shown in red and orange. The clear concentration of these gaps is in Wards 7 and 8, and to a lesser extent Ward 5.

Figure 8. Gaps in EV Penetration, by EV Share and per Capita



For EVCS, each block group as assessed per the methodology outlined above, with the largest gaps shown in purple and the subsequent gaps shown in red and orange. Gaps in charging infrastructure are slightly more evenly distributed across the District, though a pattern is visible in which downtown commercial areas, and southwest waterfront communities have lower prevalence of gaps overall.

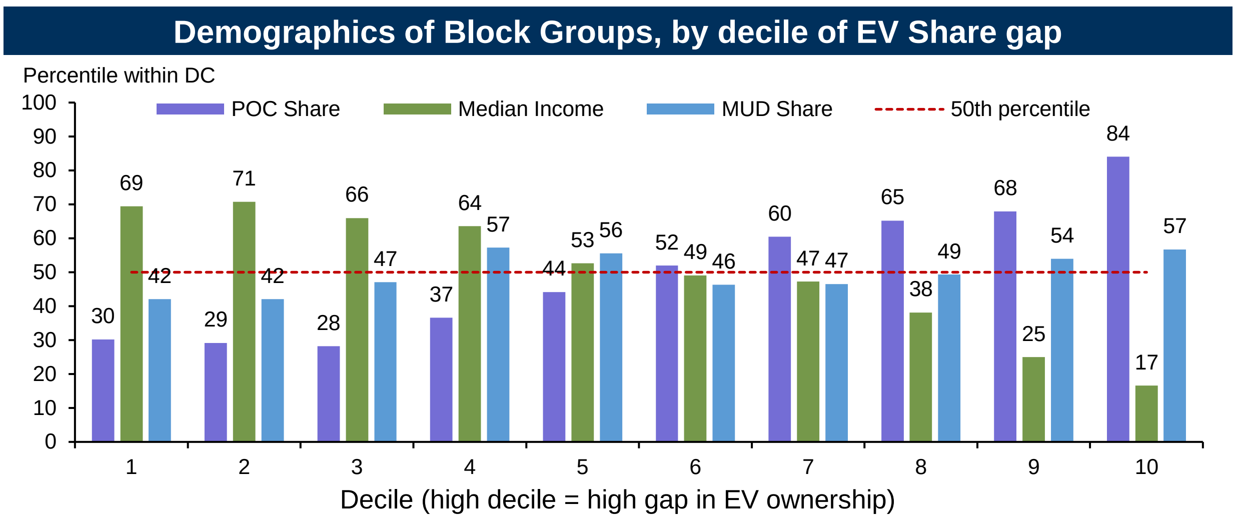
Figure 9. Gaps in Level 2 and DCFC EVCS

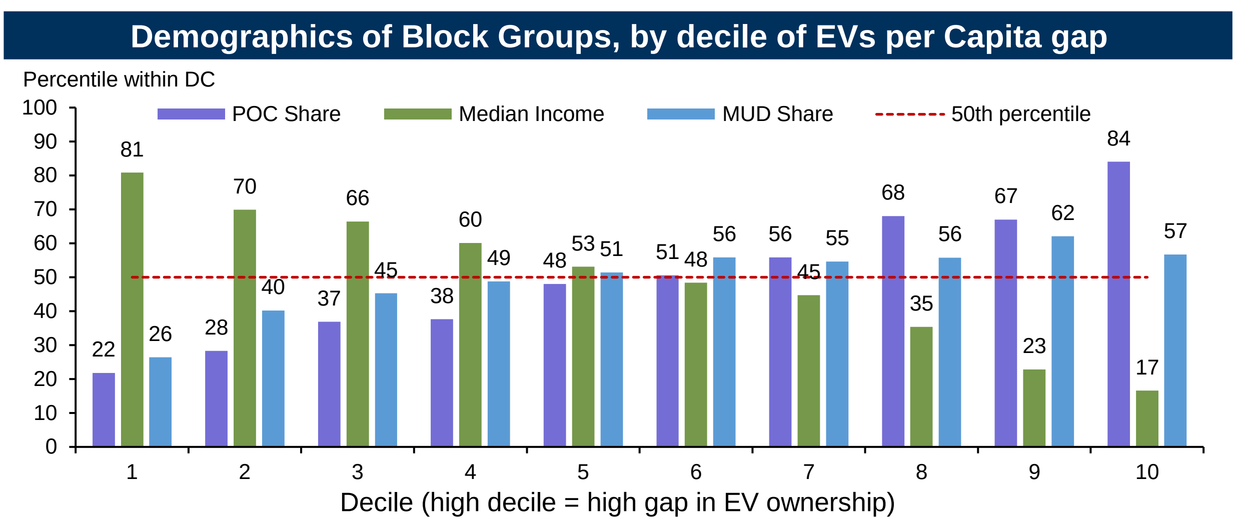


Once gaps were identified in the distribution of EVs and EVCS across the district, block groups were categorized grouped by decile (e.g., the 10 percent of block groups with the lowest gap score were placed in decile 1). The project team then conducted an overlay between each decile and three key demographic variables: percent population that are people of color (POC), median income, and percent of residences that are multi-unit dwellings (MUDs). These results are shown in Figure 10Figure 10 and Figure 11Figure 11. It is important to note that this analysis does not indicate or assess causation between these demographic variables and gaps in EVs and EVCS, merely correlation. However, this analysis could be used as a starting point for an assessment of the overall equity of EV and EVCS distribution, as well as to identify possible programmatic adjustments or approaches that could be useful given the specifics of these gap areas.

As shown in Figure 10, gaps in EV registration, both compared to total vehicle registrations (top) and total population (bottom), are much more pronounced in areas with lower median income, higher percent POC, and higher percent MUD. For example, based on total vehicle registrations, the fewest gaps are seen in areas that are 30 percent POC (30^{th} percentile of District block groups), a median income of around $117,000 ($69^{th}$ percentile), and 39 percent MUD concentration (i.e., percent of people living in MUDs; 42^{nd} percentile). Meanwhile, the areas with the highest gaps in EV penetration are 97 percent POC (over three times higher than the areas with the lowest EV gaps; 84^{th} percentile), have a median income of around $54,000 (over 50 percent less; 17^{th} percentile), and a 59 percent MUD concentration (a 50 percent share increase; 57^{th} percentile).

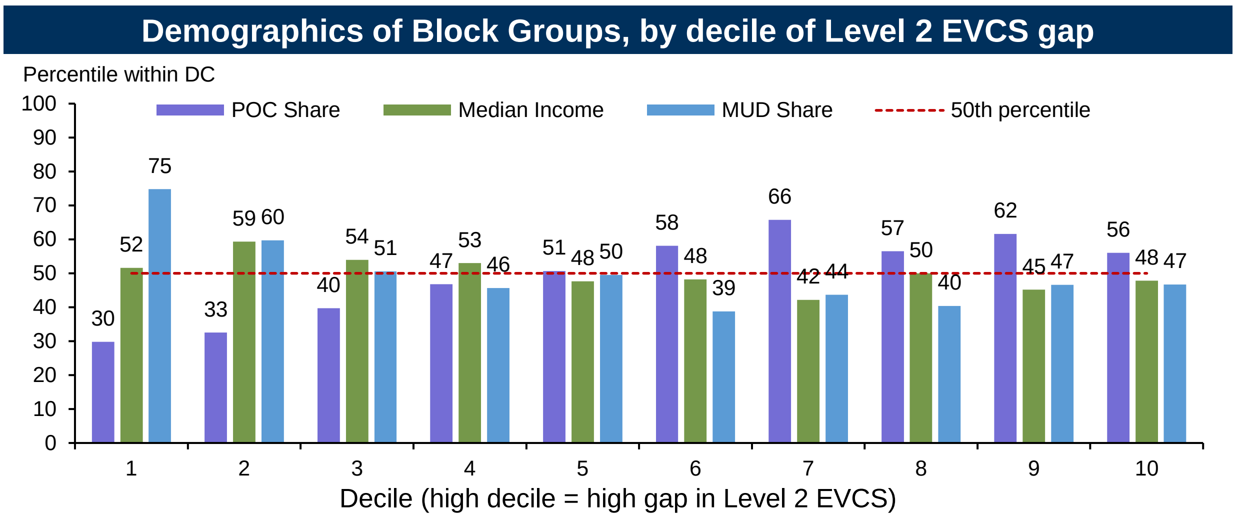
Figure 10. Gaps Analysis: Demographics of EV Gaps

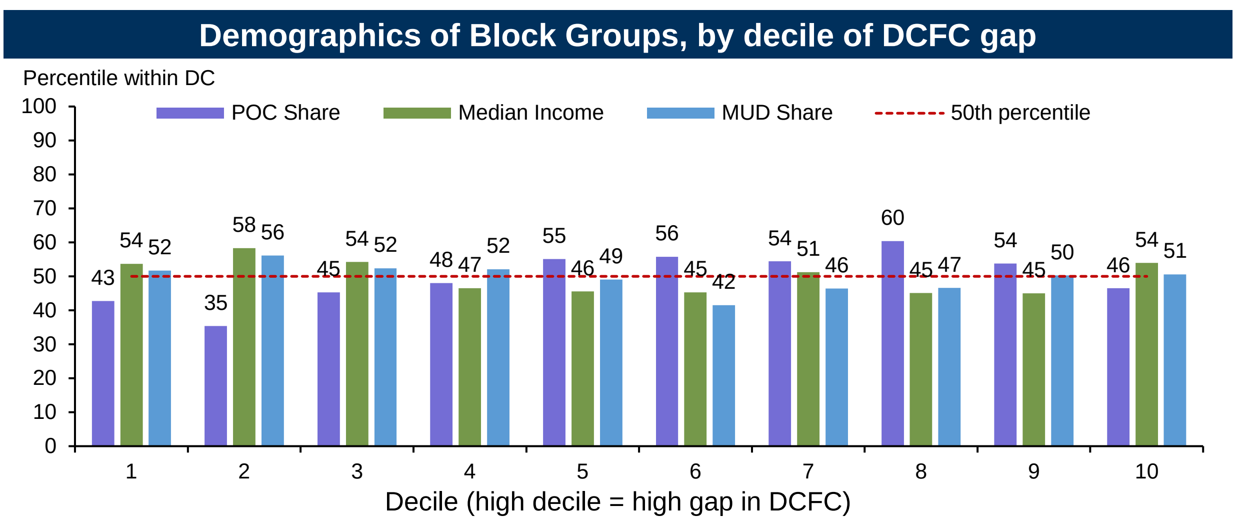




Gaps in EVCS locations and demographics have a slightly less pronounced relationship, though there remain patterns. Nearly all of the areas with smallest L2 gaps—deciles 1 through 5—have higher than average median income and lower than average percent POC, while the largest L2 gaps—deciles 6 and above—are in areas with higher-than-average percent POC and lower than average median incomes. In general, there are fewer gaps in L2 chargers where there are higher percentages of MUDs. Gaps of DCFC do not show clear demographic patterns, perhaps because there are a limited number of DCFC locations within and in close proximity to the District.

Figure 11. Gaps Analysis: Demographics of EVCS Gaps





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CERTIFICATE OF SERVICE

I hereby certify that a copy of Potomac Electric Power Company's EV Market Penetration Study was served this March 30, 2022 on all parties in Formal Case Nos. 1130 and 1155 by electronic mail.

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