

Multi-Family EV Charging Accessibility Replication Guide

The Dallas-Fort Worth (DFW) Clean Cities Coalition conducted an analysis of the accessibility of public electric vehicle (EV) charging stations in the City of Dallas and the City of Denton, with focus on multi-family properties and environmental justice areas. This reference guide outlines how to replicate this type of analysis for other communities and coalitions.

The analysis focused on accessibility of multi-family properties to publicly available charging infrastructure to assess gaps and investment needs for those populations. The Department of Energy states that over 80 percent of people charge their EV at home. But for those without personal garage spaces, such as many multi-family tenants, access to publicly available EV charging stations may be critical in the feasibility of owning an EV. DFW Clean Cities also assessed charging accessibility in relation to environmental justice populations defined by the North Central Texas Council of Governments, the DFW Clean Cities host agency, based on low income and minority populations) to further identify equity gaps in available charging infrastructure. Staff presented findings to the City of Dallas Environmental and Sustainability City Council Committee to help guide city action and investment in the future. DFW Clean Cities then replicated the analysis with the City of Denton to test methodology. This successful replication was met with positive city feedback and may be presented to city sustainability staff to be incorporated into work and future projects.

To replicate the analysis, follow the steps listed below.

DATA NEEDS

Multi-Family Property Site Addresses and Unit Totals

Gather Multi-Family Property site data for within the jurisdiction of concern.

Source: Cities may have lists of multi-family addresses registered within their city. If not, look for other regional data sources that may already have multi-family addresses available. Regional planning agencies, appraisal districts, economic development districts, or other local organizations may have that data available.

Tip: Obtain property size (resident total or unit total) for each site to allow for additional density-based calculations.

Tip: Some address lists may be administrative mailing addresses, and not necessarily indicate where residents live or sites are located. Make sure to ask these details before working with the data.

DFW Clean Cities used Development Monitoring data from the North Central Texas Council of Governments (NCTCOG), DFW Clean Cities host organization, through its Regional Data Center. Multi-family addresses were able to be selected and trimmed down to the specified study area. This data also specified addresses with total unit numbers by property.

Source: [NCTCOG Regional Data Center](#)

If unable to get a list of individual property addresses, consider downloading the total multi-family units by geographic area with the American Community Survey. While unable to see where units are dispersed, this will allow the ability to calculate the total publicly available plugs compared to

the density of total multi-family units within the same geographic bounds to see truer density-based accessibility.

Source: [2019 American Community Survey, 1-Year Estimates, US Census Bureau](#)

Public EV Charging Sites

Download publicly available station locations from the Alternative Fuels Data Center (AFDC) Station Locator tool.

Source: [Alternative Fuel Data Center Station Locator](#)

Tip: By using the advanced filters to select EV charging stations and the area being analyzed, the selected data can be exported to excel to prepare for GIS mapping. Additionally, if only select station types are wanting to be used within the study, such as level 2, all DC fast charging stations or Tesla stations can be removed from the data list prior to mapping.

Tip: If available, also collect property data that have on-site charging to understand other accessibility factors. The AFDC collects private station data that is not displayed within the station locator tool. Contact the National Renewable Energy Lab to see if there are any multi-family private stations listed in the area being analyzed.

Electric Vehicle Registration Data (optional)

If accessible, obtain data signifying if any electric vehicles are currently residing in any of the multi-family properties across the jurisdiction. While interesting to add to the analysis, due to the privacy and lack of accessibility to this data, it is not required to perform this analysis.

Source: For localized EV data, Clean Cities Coalitions can contact the National Renewable Energy Lab and request Experian data. If accessible, request criteria data, including vehicles registered at multi-family addresses.

Tip: Request data at the most granular level possible. If specific addresses are not available, Census block group data can still give better insight in local trends compared to larger data sets such as citywide.

DFW Clean Cities, through NCTCOG, purchases Texas Department of Motor Vehicle's Vehicle Registration data and performs EV queries to obtain an up-to-date list of registered vehicles and their addresses. Through this data set, DFW Clean Cities was able to cross examine all registered EVs to any matching multi-family property address to note what EVs are currently residing in multi-family properties. However, due to personally identifiable information, no raw data or specific addresses can be shared with others.

Source: For registered EV data in Texas from county, city, or zip code levels, visit the DFW Clean Cities Electric Vehicle North Texas website at www.dfwcleancities.org/evnt

Tip: If you are able to obtain specific addresses, a programming language such as Python or R can be used to find matches between addresses with registered electric vehicles and multi-family property addresses, decreasing the time it takes compared to manually matching addresses. If Python is unavailable, a manual match may also work by selecting addresses with typical multi-unit identifiers, including unit numbers or duplicative addresses.

Environmental Justice/Equity Data

Environmental justice/equity data is an important data element to determine if there is an inequitable distribution of existing publicly available infrastructure to multi-family residences in underserved communities. Because environmental justice and equity can be determined by differing variables depending on the data set being used, discuss with the city if they have a preference on specific equity criteria to use to be consistent with other city data. For a general environmental justice tool, see the Environmental Protection Agency's EJSCREEN: Environmental Justice Screening and Mapping Tool.

Source: [EJSCREEN: Environmental Justice Screening and Mapping Tool](#)

DFW Clean Cities used the NCTCOG Environmental Justice Index, which focuses on region-specific equity data on minority and low-income populations.

Source: [NCTCOG North Texas Environmental Justice Data](#)

Census Block Group Boundary Data

Download Census block groups boundary data from the U.S. Census Bureau and trim down to study area to be able to analyze and map within the jurisdiction on smaller scales to give more insight on infrastructure accessibility gaps.

Source: U.S Census Bureau Census Block Groups

Special Study Area Boundaries, as Appropriate

Add additional geographic breakdowns of the study area boundaries to better understand and educate of increased opportunities in areas represented.

Example: If the area being analyzed has city council districts or any administrative districts within its jurisdiction, it is encouraged to include the boundary layer within the map and analysis.

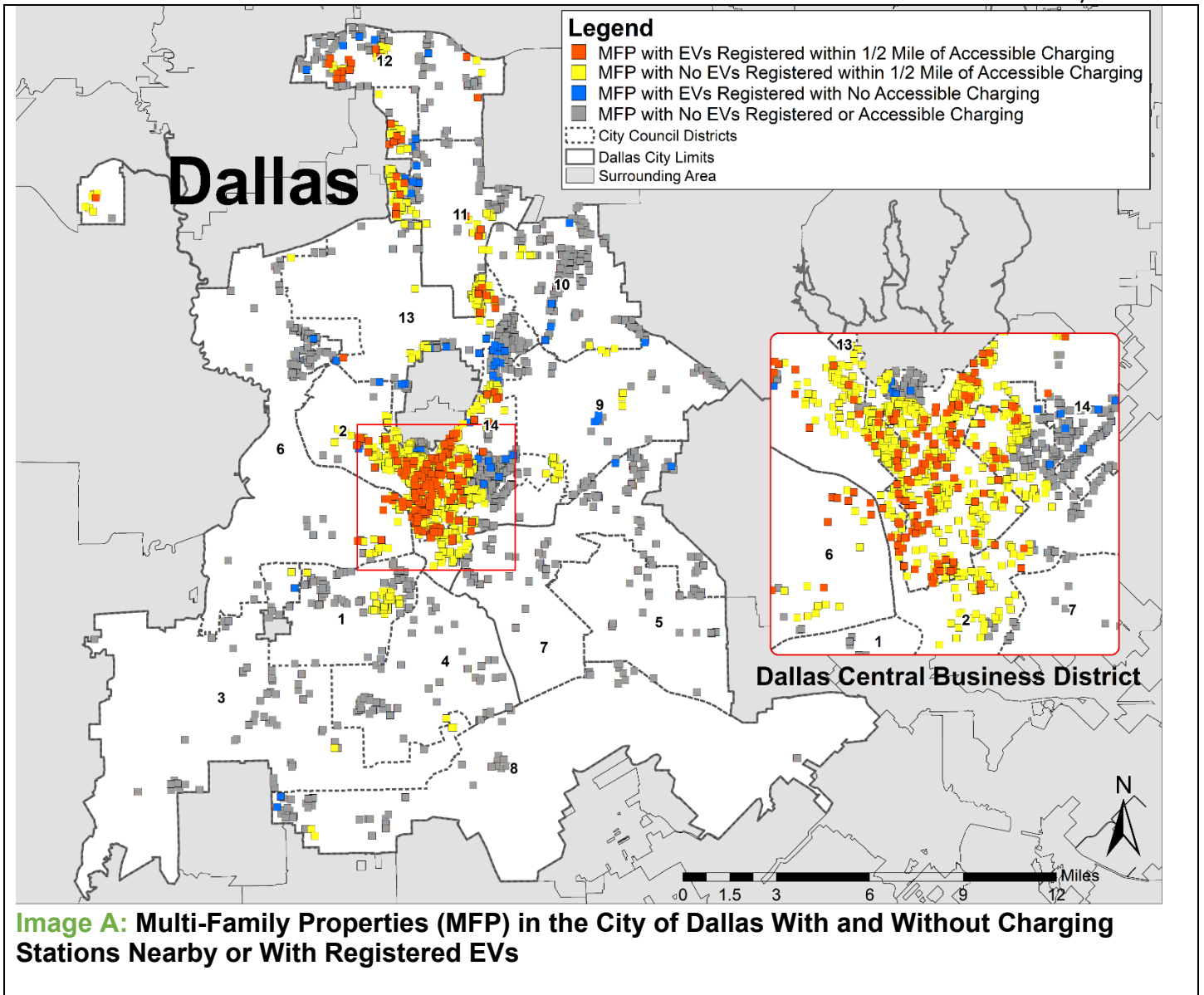
DFW Clean Cities staff evaluated two major elements to EV charging accessibility:

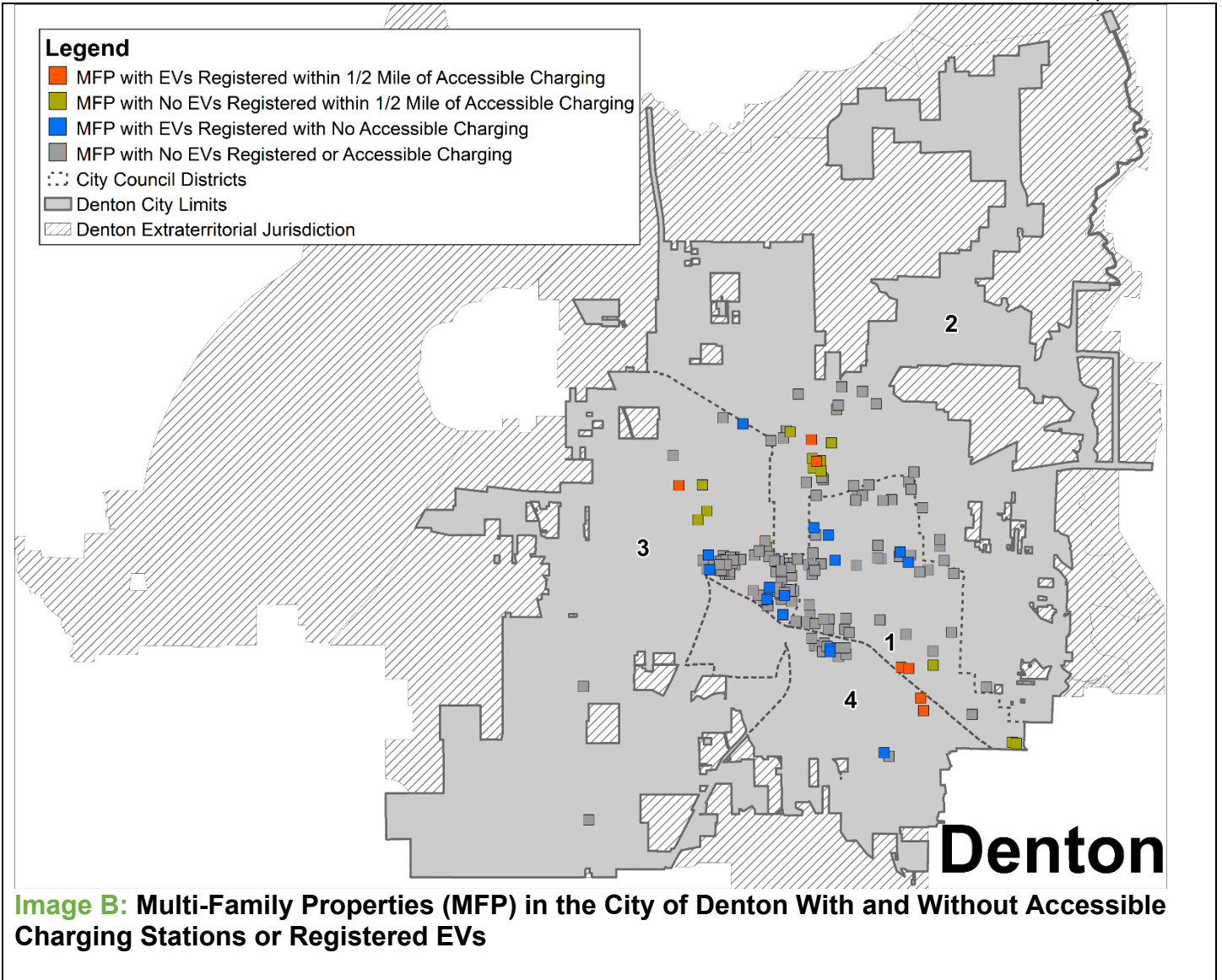
- 1) **Proximity** (EV chargers were located nearby, based on a distance buffer). That is, an EV driver can reasonably find a publicly available charger nearby.
- 2) **Availability** (ratio of EV charger plugs to multi-family housing units within a given Census block group). In other words, while a charger may be available across the street, if 500 EV owners are competing to use the same plug, that charging station may not really be as 'available' as one further away with less demand.

Note that proximity and availability were assessed using different methodologies (one uses a distance buffer and the other uses a Census block group boundary). This was due to time and resource constraints. A preferred approach would be to establish a consistent spatial grid to overlay on the study area to evaluate both proximity and availability according to the same spatial scale. For example, a limitation of the approach identified here is that if charging station plugs are available near a multi-family property, but the Census block group boundary happens to fall between the property and the plugs, the ratio will not reflect the availability of those charging stations that fall just outside the boundary.

GIS MAP GUIDANCE**Assessing Proximity: Walkable Accessibility of Multi-Family Properties to Publicly Available EV Charging Stations and Environmental Justice Analysis****Steps:**



1. Upload all data layers.
2. Determine what “accessibility” means for the community being studied. For these initial analyses, DFW Clean Cities used a half-mile radius to be consistent with the walkability threshold to transit stops used by other initiatives at NCTCOG. However, a shorter distance may be more appropriate when considering walking to charge a vehicle, such as one quarter of a mile. Once distance is decided, select multi-family properties that intersect within a half-mile buffer (or whichever walkable radius chosen for this study) of an EV charging station and note in data table. This subset of properties was defined by DFW Clean Cities as “MFPs with accessible charging”.
3. Select multi-family properties that do not intersect within the chosen accessibility buffer of an EV charging station and note in data table. This subset of properties is defined as “MFPs with no accessible charging”.
4. Select multi-family properties that intersect layers of Environmental Justice Index and note in data table. This subset of properties is defined as “MFPs within EJ areas”.
5. Query data to gather statistics on number of multi-family properties that are within the accessibility boundary versus those that are outside the accessibility boundary.
 - a. Compare statistics by the properties within environmental justice areas versus properties that are not to understand if properties within EJ areas have lesser access to charging stations compared to properties outside of EJ areas.
6. Create a map showing multi-family properties that are and are not within the accessibility boundary using the data tables noted in steps 2-4 (Images A & B)
7. Add environmental justice data later to the map created in step 6 to create a map showing multi-family properties with and without accessible charging in relation to environmental justice areas (Images C & D)





MULTI-FAMILY PROPERTIES WITH AND WITHOUT CHARGING STATION ACCESS OR REGISTERED EVs

CITYWIDE

	
MFPs Without Nearby Charging	MFPs in an EJ Area Without Nearby Charging
54%	67%

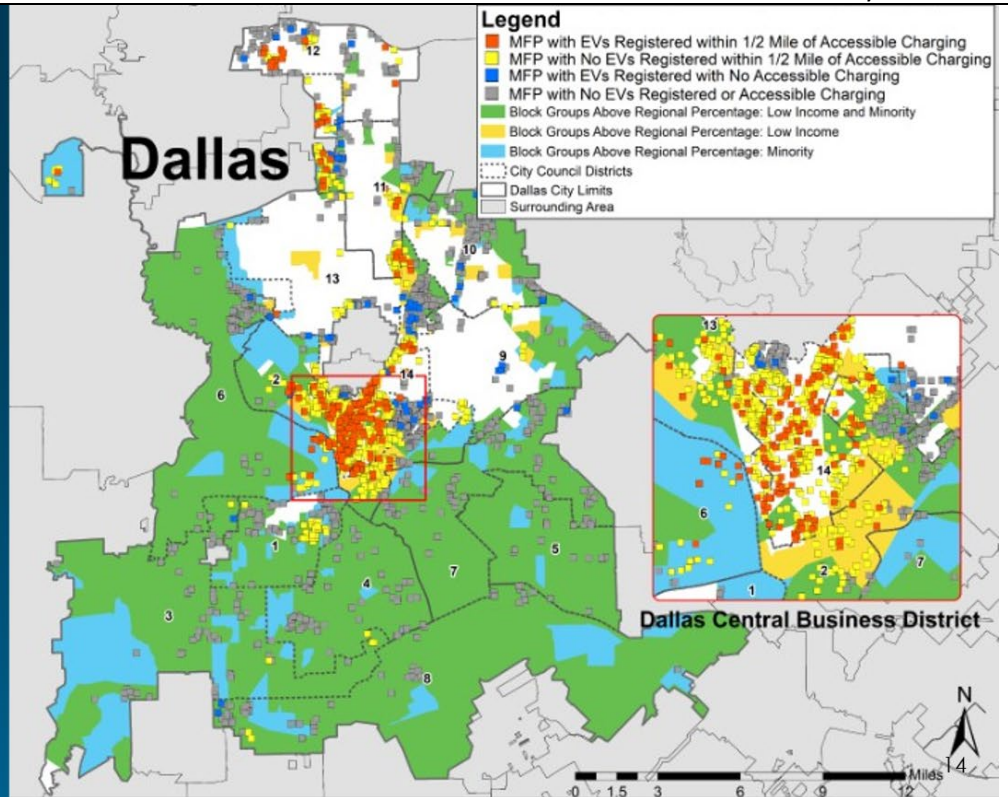




Image C: Multi-Family Properties in the City of Dallas With and Without Charging Station Access or Registered Evs Compared to Environmental Justice Areas

MULTI-FAMILY PROPERTIES WITH AND WITHOUT CHARGING STATION ACCESS OR REGISTERED EVs

CITYWIDE

	
MFPs Without Nearby Charging	MFPs in an EJ Area Without Nearby Charging
89%	92%

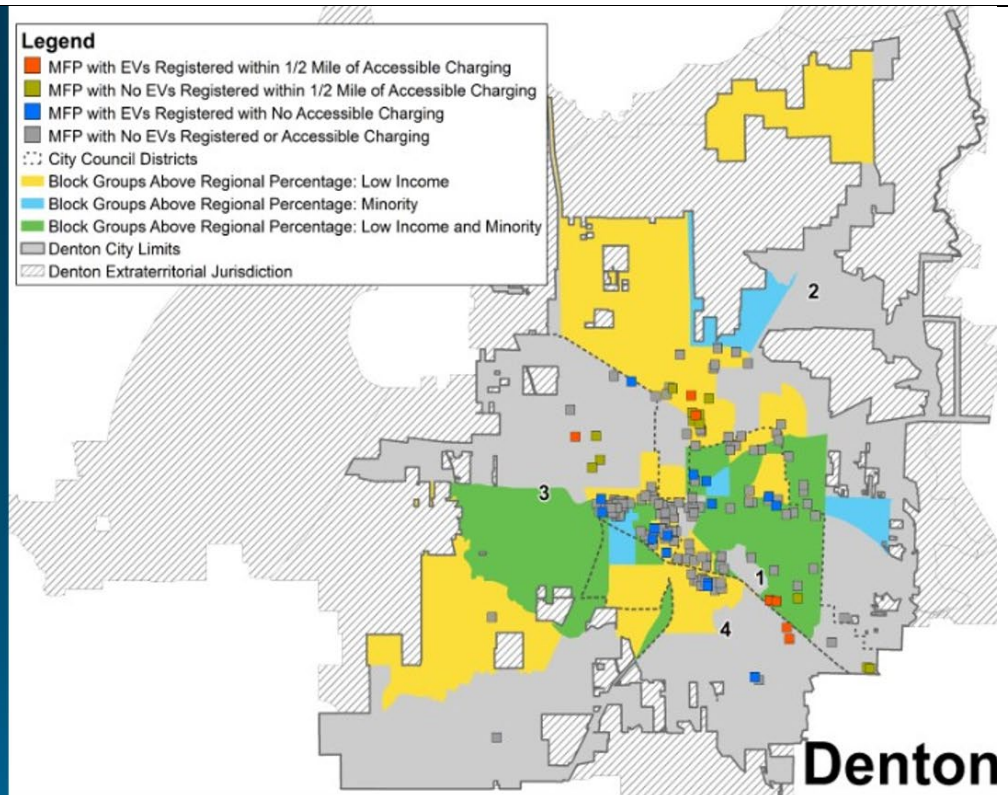


Image D: Multi-Family Properties in the City of Denton With and Without Charging Station Access or Registered Evs Compared to Environmental Justice Areas

Assessing Availability: Ratio of Accessible EV Charging Plugs per Total Multi-Family Units Density Analysis

Steps:

1. Upload all data layers.
2. Sum number of units from multi-family properties that fall within each Census block group and add to a spreadsheet.
3. Sum number of plugs from EV charging stations that fall within each Census block group and add to same spreadsheet.
4. Divide number of plugs by number of units within each block group on the spreadsheet and multiply by 10,000 to get the total ratio amount of accessible EV charging plugs per 10,000 units within each Census block group. This will determine accessibility based on total plug to housing unit density rather than just locational proximity. As the City of Denton is much smaller than the City of Dallas, the ratio was calculated per 1,000 units to be a more realistic scale.
5. Create map of plug per unit ratio by Census blocks with categories: no plugs, <1 plug, 1-3 plugs, 4-10 plugs, 11-15 plugs, and >15 plugs; or self-chosen levels as shown in Images E and F

If Unable to Get Individual Property Unit Data:

For total multi-family units by geographic area, use the American Community Survey. While unable to see where units are dispersed, this will allow the ability to calculate the total publicly available plugs compared to the density of total multi-family units within the same geographic bounds to see truer density-based accessibility.

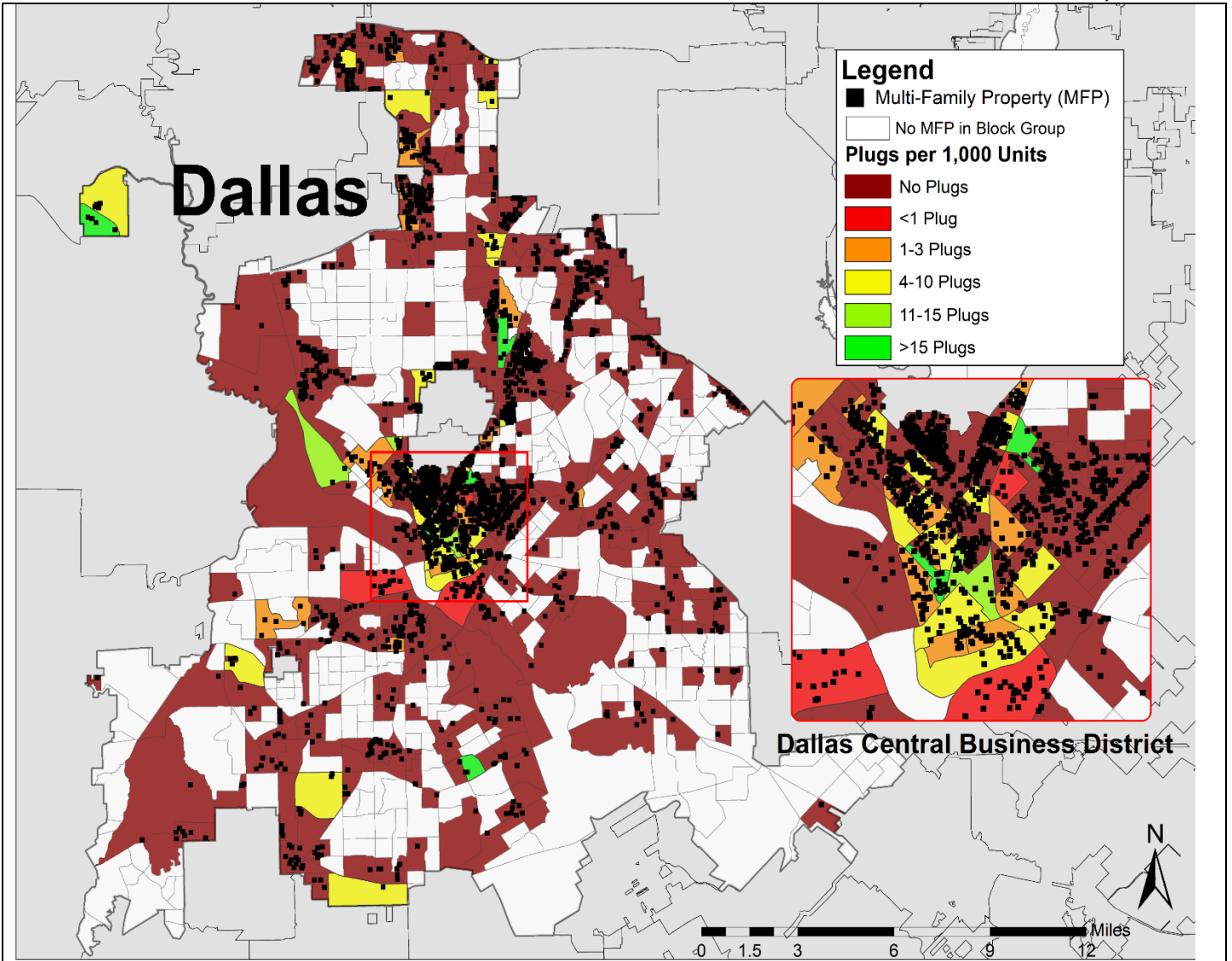


Image E: Multi-Family Properties by Unit Totals and Availability of Public Access EV Charging Plugs by Block Group in City of Dallas

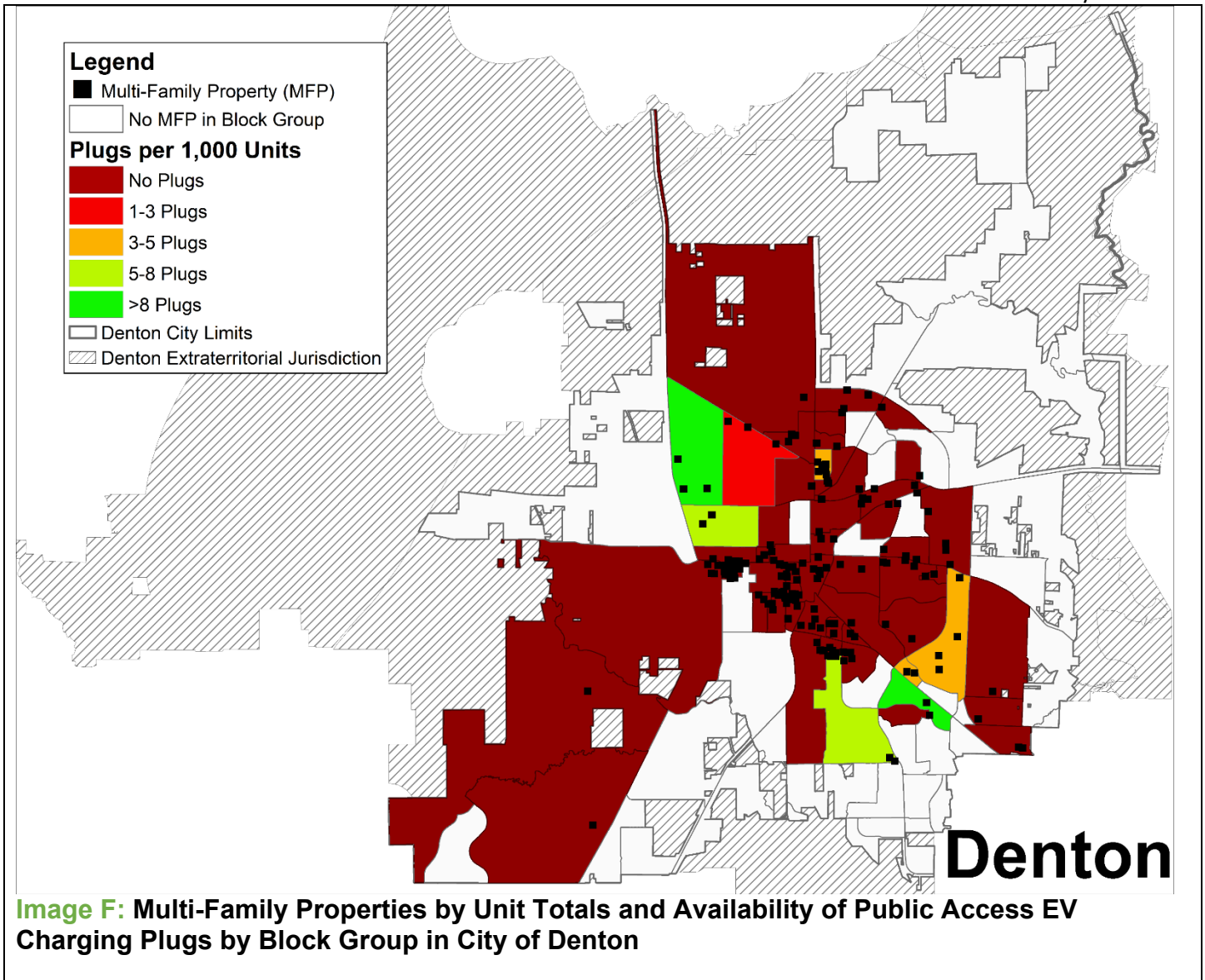


CHART AND SHOWCASE DATA

Once data is mapped, it is important to take the results and input into differing tables, charts, and graphs. Save specified data into excel and create different visualizations to help solidify the messaging of the map itself. Depending on your audience and goals, visualizing data in different ways can help achieve a message and help the audience fully understand the driving forces behind the analysis.

Examples below:

**CITY OF DALLAS
MULTI-FAMILY UNITS
AND CHARGING
STATION
AVAILABILITY BY
COUNCIL DISTRICT**

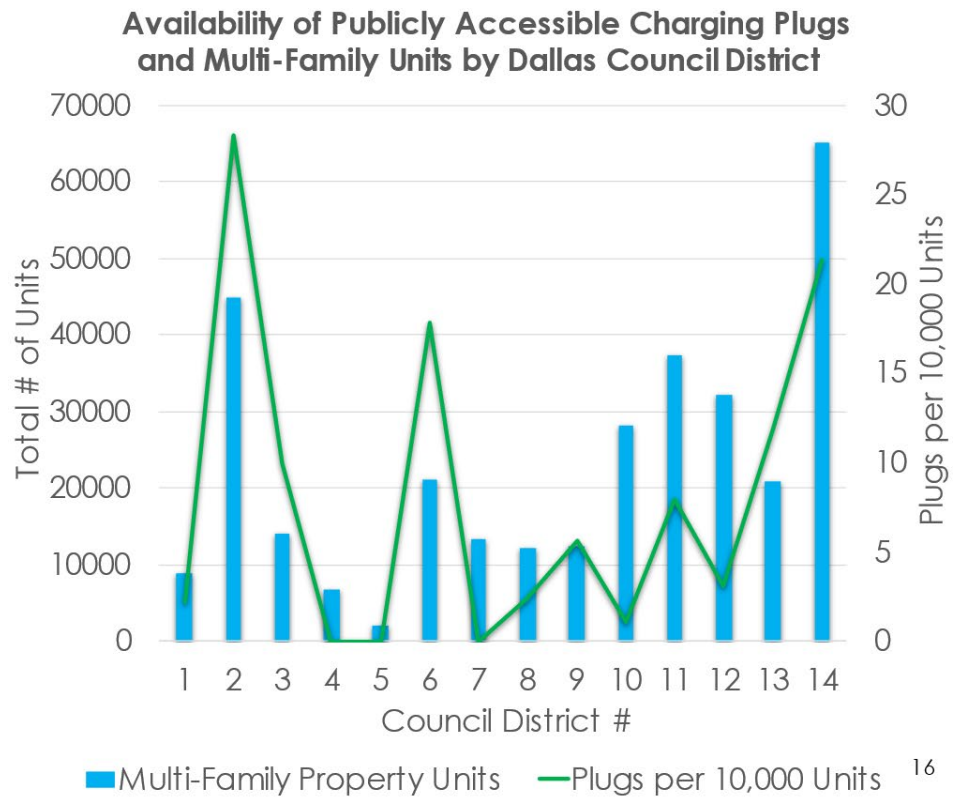
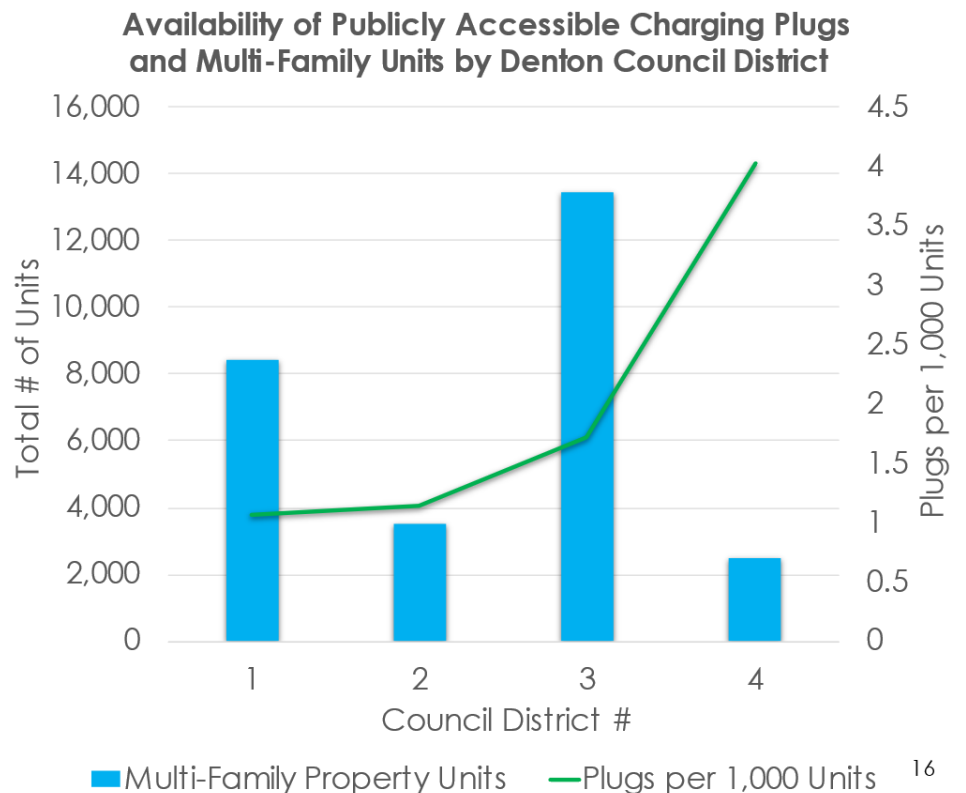


IMAGE G: Double Axis Chart showing total units by City Council District in comparison to total plugs accessible per 10,000 units for City of Dallas

**CITY OF DENTON
MULTI-FAMILY UNITS
AND CHARGING
STATION
AVAILABILITY BY
COUNCIL DISTRICT**



CITY OF DALLAS CHARGING STATION ACCESS BY COUNCIL DISTRICT	Council District	Multi-Family Properties Without Nearby Charging		Public Charging Plugs per 10,000 MFP Units
		Overall	In an EJ Area	
In general, multi-family properties in an Environmental Justice area are less likely to have charging stations nearby.	1	68%	67%	2.2
	2	29%	35%	28.3
	3	93%	93%	10.0
	4	98%	98%	0.0
	5	100%	100%	0.0
	6	73%	71%	17.9
	7	100%	100%	0.0
	8	96%	96%	2.5
	9	86%	88%	5.6
	10	94%	96%	1.1
	11	46%	51%	8.0
	12	76%	100%	3.1
	13	81%	92%	11.9
	14	30%	43%	21.4

IMAGE 1: Table broken down by City of Dallas City Council District to show overall accessibility of EV charging stations by multi-family properties city-wide, compared to multi-family properties within environmental justice areas. This was summarized to highlight the fact that properties within environmental justice areas tend to have less access to a charger. Additionally, this table shows the ratio calculated of accessible EV charger plugs per 10,000 multi-family units in each Census block group to emphasize that density of multi-family properties within geographic proximity of a plug has significant impacts on charging accessibility.

CITY OF DENTON CHARGING STATION ACCESS BY COUNCIL DISTRICT

Council District	Multi-Family Properties Without Nearby Charging		Public Charging Plugs per 1,000 MFP Units
	Overall	In an EJ Area	
1	90%	93%	1.1
2	68%	64%	1.1
3	95%	100%	1.7
4	89%	100%	4.0

In general, multi-family properties in an Environmental Justice area are less likely to have charging stations nearby.

DENTON CITY AVERAGE		
Multi-Family Properties Without Nearby Charging		Public Charging Plugs per 1,000 MFP Units
Overall	In an EJ Area	
89%	92%	1.7

IMAGE J: Table broken down by City of Denton City Council District to show overall inaccessibility of EV charging stations by multi-family properties city-wide, compared to multi-family properties within environmental justice areas.

PRESENT DATA AND SUGGEST NEXT STEPS

Once the analysis is complete, present to the city and help them determine possible next steps they can do with this information. This analysis is a starting point for understanding existing accessibility. In order see results and changes, encourage cities to take the data and use within their own projects, investments, and policy changes to help further increase EV charging accessibility for their residents.

Suggested next steps presented to City of Dallas:

- Continue Existing City Efforts**
City Staff had Already Initiated the Following Steps: Coordination with the Apartment Association of Greater Dallas, Direct Outreach to all Multi-Family Properties, and Applications for New City-Owned Charging Stations.
- Identify and Fill Charging Gaps**
Identify Locations that would Fill a Charging Gap. Encourage Property Owners to Install Public EV Charging or Consider Additional Chargers on City-Owned Property.
- Consider Adopting a Multi-Family Charging Policy/Ordinance**
Requires Minimum EV Charging Readiness/Installation for Existing or New Construction Multi-Family Housing.
- Partner for Available Funding**
Pursue and Promote Funding Incentives. Educate Property Owners on the Benefits of EV Charging at their Property.

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For questions on process, data, and results, please contact:

Bailey Muller
DFW Clean Cities Staff
Bmuller@nctcog.org

Lori Clark
DFW Clean Cities Coordinator
Lclark@nctcog.org



**Dallas-Fort Worth
CLEAN CITIES**

www.dfwcleancities.org