



User Guide

Evaluation & Development of Regional Infrastructure for Vehicle Electrification Model (E-DRIVE)

Version 1.0 (released September 2021)

Overview & Contacts

Welcome to the Evaluation & Development of Regional Infrastructure for Vehicle Electrification Model (E-DRIVE). Developed by M.J. Bradley & Associates (MJB&A) in collaboration with Georgetown Climate Center and Ceres, E-DRIVE is a dynamic analytical resource to support planning and development of electric vehicle fast charging infrastructure throughout the United States. The Model provides a highly customizable interface to support a diverse set of users and produce results that reflect a wide range of priorities across nearly all census tracts in the country.

E-DRIVE is a data-driven tool that considers a variety of metrics to determine high priority areas for fast charging development, such as:

- All publicly-available fast chargers in the U.S. (as of the most recent release date)
- Effectively all non-local roadways (interstates, highways, arterials, collectors, etc.) and corresponding vehicle-miles traveled (VMT)
- Over 2.8 trillion annual VMT (nearly 90% of national total annual VMT)
- Over one million commercial locations and other points of interest

The E-DRIVE Model is a screening tool that provides initial insight into areas that may be suitable for new fast charging infrastructure. Additional analysis, planning, and consideration of local factors may also be necessary to identify individual locations that are best-suited for development. This model does not account for economic factors, electric utility capacity availability, individual trip data, projected travel behavior, and other elements that may impact development decisions.

This tool can be accessed on our website at: www.mjbradley.com/analytical-resources.

Please contact MJB&A (contact information below) if you have questions regarding the E-DRIVE Model, are interested in additional analytical resources, or would like to collaborate on charging infrastructure development projects more specific to your needs.

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Introduction

1. Dashboard Tabs

The screenshot shows the E-DRIVE dashboard interface. At the top, there is a navigation bar with tabs: Welcome to E-DRIVE, E-DRIVE Directions, New England, Middle Atlantic, South Atlantic, East South Central, East North Central, and West So. Below the tabs is a yellow banner with the text: ^ Use tabs above to navigate across dashboards and regions of interest ^. The main content area is titled "Evaluation & Development of Regional Infrastructure for Vehicle Electrification (E-DRIVE)". It contains a welcome message, a description of the tool, and a list of features. At the bottom, there are two buttons: "Click to Continue to E-DRIVE Directions" and "Contact Information".

Welcome to the E-DRIVE Model, a user-friendly analytical resource to support planning and development of electric vehicle fast charging infrastructure throughout the United States. Developed by M.J. Bradley & Associates (MJB&A) in collaboration with Georgetown Climate Center and Ceres, E-DRIVE is a data-driven tool that considers a variety of metrics important to fast charging infrastructure development, including proximity to the existing fast charging network, traffic volume, nearby commercial activity, access to home charging, and other demographic and environmental indicators. This tool provides a highly customizable interface to support a diverse set of users and produce results that reflect a wide range of priorities.

E-DRIVE applies the same analytical approach across all regions of the United States and uses federal and national-level data sources to ensure consistent data quality. The nationwide dataset utilized by the E-DRIVE Model accounts for:

- All publicly-available direct current fast chargers (DCFC) in the U.S. and Canada (as of September 24, 2021; download spreadsheet of included stations above)
- Effectively all non-local roadways (interstates, highways, arterials, collectors, etc.) and corresponding vehicle-miles traveled (VMT)
- Over 2.8 trillion annual vehicle-miles traveled (nearly 90% of national total annual VMT)
- Over one million commercial locations and other points of interest
- Over 99.5% of all populated census tracts

The E-DRIVE Model is a screening tool that provides initial insight into areas that are potentially suitable for the development of fast charging infrastructure. Additional analysis, planning, and consideration of local factors are necessary to identify individual locations that are best-suited for charging infrastructure development. Please contact MJB&A (info below) if you have questions regarding the E-DRIVE Model, are interested in additional analytical resources, or would like to collaborate on charging infrastructure development projects more specific to your needs.

2. Continue to Directions

3. Contact Information

Contact Information

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Use tabs to navigate across dashboards

Click to view summary instructions on how to define geographic scope, assign filters, and apply metric weights

Contact information for additional questions or interest in future collaboration

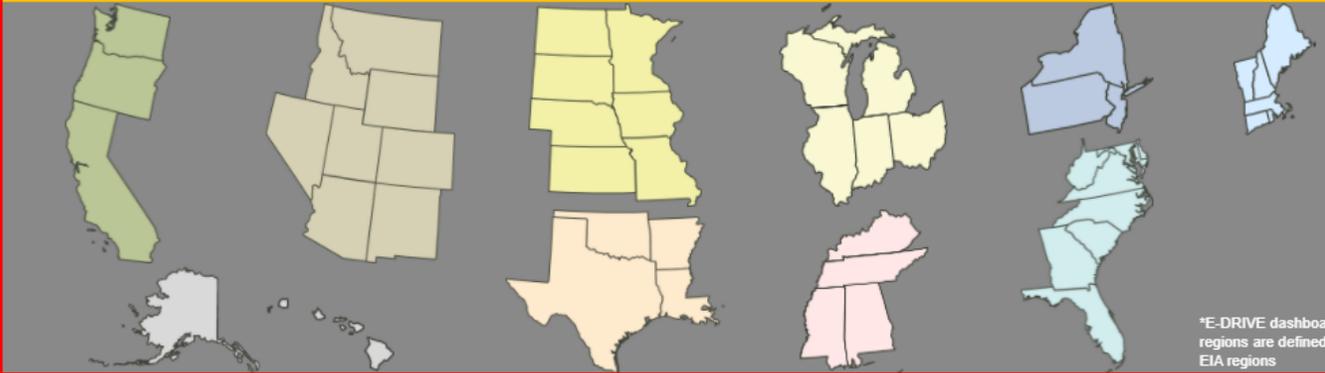
Summary Directions and Navigation to Region Dashboards

Welcome to E-DRIVE | E-DRIVE Directions | New England | Middle Atlantic | South Atlantic | East South Central | East North Central | West So | >

Directions for E-DRIVE Model (consult "User Guide" using link above for additional information)

<p>1. Analysis Parameters</p> <p>Determine the geographic area of the analysis by defining any variation of the following inputs:</p> <ul style="list-style-type: none"> - States - Metro areas within selected states - Counties within selected area - Proximity to major roadways <p>In addition, define the DCFC plug types considered for the analysis:</p> <ul style="list-style-type: none"> - All plug types, which include SAE (J1772 and CCS), CHAdeMO, and Tesla - SAE and CHAdeMO plug types only (non-Tesla) <p>1. Analysis Parameters</p>	<p>2. Equity Considerations</p> <p>Further define geographic scope by accounting for areas that meet certain demographic and environmental criteria, including:</p> <ul style="list-style-type: none"> - Qualified Opportunity Zone (QOZ) - EPA EJSCREEN EJ Index Percentiles <ul style="list-style-type: none"> > Demograph > Ozone > PM2.5 > PM10 > PM10-2.5 > PM2.5-10 > PM2.5-10 <p>For more information on QOZ and EJ Index Values, use the following links:</p> <ul style="list-style-type: none"> - QOZ (https://www.irs.gov/credits-deductions/businesses/opportunity-zones) - EJ Index Values (https://www.epa.gov/ej/ej-screen/justice-indexes-ej-screen) <p>2. Equity Considerations</p>	<p>3. Metric Weighting</p> <p>Define the importance of each metric that is used to calculate a suitability score/ranking for all census tracts within the defined geographic scope. Metrics include:</p> <p>DCFC Proximity</p> <ul style="list-style-type: none"> - Distance: Distance to existing DCFC - Port Density: Number of nearby DCFC ports <p>Demand</p> <ul style="list-style-type: none"> - Traffic Volume Annual Total Maximum AADT - Nearby Activity: Nearby Points of Interest <p>Demographics</p> <ul style="list-style-type: none"> - Population Density - Access to Home Charging <p>The sum of all weights <u>must equal 100 percent</u> for the model to produce results. Default weights reflect a scenario in which proximity, traffic volume, and nearby activity are similarly prioritized, with less significance placed on demographics. See the user guide for examples of alternative weighting methodologies.</p> <p>3. Metric Weighting</p>	<p>4. Results</p> <p>View and analyze results of the active scenario by using the following functionalities:</p> <ul style="list-style-type: none"> - Filter by Tract Rank (filter tracts) - Highlight Census Tract (search for a tract) - Ranked Tracts (tabular results) <ul style="list-style-type: none"> > Click the "Rank" header and click the "Sort Census Tracts ascending by Measure Values" icon to organize tracts by rank <p>Note that additional information related to each tract can be viewed by hovering the cursor over individual tracts. The current rank of the tract (specific to active scenario), calculated metric decile value, and EPA EJSCREEN EJ Index state percentile values are provided in the pop-up box.</p> <p>4. Results</p>
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Navigate to your dashboard of interest by clicking one of the regions* below:



*E-DRIVE dashboard regions are defined by EIA regions

All dashboards have four regions with customizable inputs and components

- 1. Analysis Parameters**
 - Geographic scope and plug type filters
- 2. Equity Considerations**
 - Designated Qualified Opportunity Zones (QOZ) and EPA EJ Index Values
- 3. Metric Weighting**
 - Weighting score of each data metric
- 4. Results**
 - Census tract rankings of active scenario

Click on region to quickly navigate to specific E-DRIVE dashboard

- Tabs on top of dashboard can always be used for navigation

E-DRIVE Dashboard: Overview

Welcome to E-DRIVE | E-DRIVE Directions | New England | Middle Atlantic | South Atlantic | East South Central | East North Central | West So

Analysis Parameters

Select State(s):
(All)

Select Metro Area(s):
(All)

Select County(ies):
(All)

Proximity to Interstates or Highways:
(All)

DCFC Plug Types Considered:
All (SAE, CHAdeMO, & Tesla)

Results Map

Results

Census Tract Rank
(1=high suitability)

1 3,365

Filter by Tract Rank

1 3,365

Highlight Census Tract

Highlight Census Tract

Equity Considerations

Tracts win Opportunity Zones (QOZ)?
(All)

EPA EJSCREEN EJ Index Percentiles

State % of Demographic Index:
0 100

State % of Ozone Index:
0 100

State % of NATA Resp. Hazard Index:
0 100

Metric Weighting

Enter values to define the relative weight or importance of each metric (must sum to 100)

DCFC Proximity Metrics		Demographic Metrics		Demographic Metrics		Total (must=100)
Distance	Port Density	Traffic Volume	Pop. Density	Home Access		
15	15	30	30	5	5	100

Results Data

Click "Rank" and select "Sort Census Tracts ascending..." to sort by rank

Census Tract	Rank
Hillsborough, NH (Tra..	1
Hillsborough, NH (Tra..	2
Hillsborough, NH (Tra..	3
Hillsborough, NH (Tra..	4
Worcester, MA (Tract..	4
Hillsborough, NH (Tra..	6
Worcester, MA (Tract..	6
Merrimack, NH (Tract..	8
Essex, MA (Tract 252..	9
Rockingham, NH (Tra..	10
Windham, CT (Tract ..	11
Essex, MA (Tract ..	11

Note: Final tract rankings are relative and specific to the geographic scope, parameters, and metric weighting defined in the active scenario only

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E-DRIVE Dashboard: Analysis Parameters

The screenshot shows the E-DRIVE dashboard interface. A red box highlights the 'Analysis Parameters' section on the left, which includes dropdown menus for State(s), Metro Area(s), County(ies), Proximity to Interstates or Highways, and DCFC Plug Types Considered. Below this is the 'Equity Considerations' section with sliders for various indices. The central map displays the New England region with a color-coded overlay representing suitability. On the right, a 'Ranked Tracts' table lists census tracts and their ranks. At the bottom, a 'Metric Weighting' table defines the relative importance of various metrics.

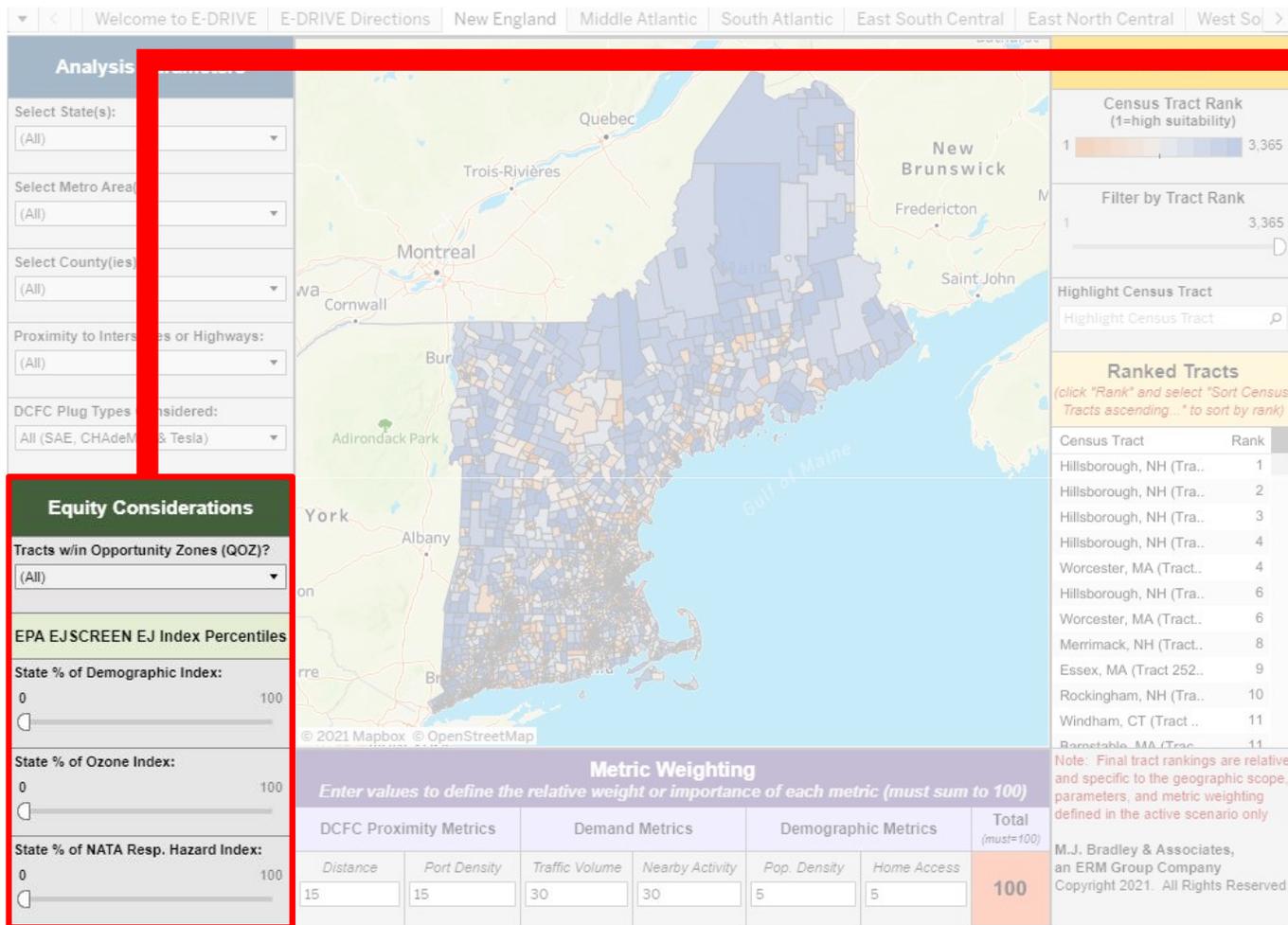
Enter values to define the relative weight or importance of each metric (must sum to 100)						
DCFC Proximity Metrics		Demand Metrics		Demographic Metrics		Total (must=100)
Distance	Port Density	Traffic Volume	Nearby Activity	Pop. Density	Home Access	
15	15	30	30	5	5	100

Analysis Parameters

*Define parameters using dropdown menus
(filters are dependent on all other active filters)*

- 1. Select State(s)**
 - Select individual or multiple states to be included in analysis
- 2. Select Metro Area(s)**
 - Limit analysis to census tracts within specific metro area(s)
- 3. Select County(ies)**
 - Further limit analysis to census tracts within specific county(ies)
- 4. Proximity to Interstates or Highways**
 - Focus on census tracts that are located within or outside of one mile of interstates or U.S. highways
- 5. DCFC Plug Types Considered**
 - Define the DCFC plug types that are considered when calculating proximity metrics (all port connector types or all non-Tesla ports)

E-DRIVE Dashboard: Equity Considerations



Equity Considerations

*Define with dropdown menu and sliders
(filters are dependent on all other active filters)*

- 1. Tracts w/in Opportunity Zones (QOZ)?**
 - Determine whether analysis is limited to tracts within designated Qualified Opportunity Zones (QOZ)*

EPA EJSCREEN EJ Index Percentiles (slider filters)**

- 2. State % of Demographic Index**
 - Analyze census tracts that contain a block group with a Demographic EJ Index value that is above the defined state percentile
- 3. State % of Ozone Index**
 - Analyze census tracts that contain a block group with an Ozone EJ Index value that is above the defined state percentile
- 4. State % of NATA Resp. Hazard Index**
 - Analyze census tracts that contain a block group with a NATA Respiratory Hazard EJ Index value that is above the defined state percentile

* A QOZ is an economically-distressed community where new investments may be eligible for preferential tax treatment (click [link](#) for more information)

** U.S. EPA developed EJSCREEN to address public health and environmental responsibilities and combines environmental and demographic indicators (click [link](#) for more information)

E-DRIVE Dashboard: Metric Weighting

The screenshot shows the E-DRIVE dashboard interface. On the left, there are several dropdown menus for 'Analysis Parameters' and 'Equity Considerations'. The central map displays a geographic area with various census tracts highlighted in shades of blue and orange. On the right, there are controls for 'Census Tract Rank' and a 'Ranked Tracts' table. At the bottom, a table titled 'Metric Weighting' allows users to define the relative importance of different metrics, with a total weight of 100.

Metric Weighting						
Enter values to define the relative weight or importance of each metric (must sum to 100)						
DCFC Proximity Metrics		Demand Metrics		Demographic Metrics		Total (must=100)
Distance	Port Density	Traffic Volume	Nearby Activity	Pop. Density	Home Access	
15	15	30	30	5	5	100

Metric Weighting

Weighting scores to define user priorities (scores must sum to 100 to generate results)

- DCFC Proximity Metrics**
 - Distance*: Distance from existing DCFC stations to each census tract
 - Port Density*: Concentration of nearby DCFC ports
- Demand Metrics**
 - Traffic Volume*: Vehicle-miles traveled (VMT) and maximum roadway annual average daily traffic (AADT) w/in and near each tract
 - Nearby Activity*: Concentration of nearby commercial establishments and other points of interest
- Demographic Metrics**
 - Population density*: Population density of each tract
 - Home Access*: Estimated residential access to home charging

Metric Weighting Considerations

E-DRIVE provides the flexibility to define the relative importance of metrics to produce an analysis more reflective of user-specific priorities. For instance, if the user wants to: 1) fill gaps within the existing DCFC network, more weight should be placed on the “DCFC Proximity Metrics;” 2) prioritize traveler use, mor weight could be placed on traffic volume and nearby activity; or 3) focus on local DCFC development, demographic metrics could be highlighted.

E-DRIVE Dashboard: Results Data

The dashboard includes several sections:

- Analysis Parameters:** Select State(s), Metro Area(s), County(ies), Proximity to Interstates or Highways, and DCFC Plug Types Considered.
- Equity Considerations:** Tracts w/in Opportunity Zones (QOZ)?, EPA EJSCREEN EJ Index Percentiles, and State % of Demographic/Ozone/NATA Resp. Hazard Index.
- Metric Weighting:** A table for defining metric weights.

Metric Weighting							Total
Enter values to define the relative weight or importance of each metric (must sum to 100)							(must=100)
DCFC Proximity Metrics		Demand Metrics		Demographic Metrics			
Distance	Port Density	Traffic Volume	Nearby Activity	Pop. Density	Home Access	100	
15	15	30	30	5	5		

Results Pop-up:

- Census Tract Rank (1=high suitability):** Color bar legend from 1 (orange) to 3,365 (blue).
- Filter by Tract Rank:** Slider from 1 to 3,365.
- Ranked Tracts:**

Census Tract	Rank
Hillsborough, NH (Tra..	1
Hillsborough, NH (Tra..	2
Hillsborough, NH (Tra..	3
Hillsborough, NH (Tra..	4
Worcester, MA (Tract..	4
Hillsborough, NH (Tra..	6
Worcester, MA (Tract..	6
Merrimack, NH (Tract..	8
Essex, MA (Tract 252..	9
Rockingham, NH (Tra..	10
Windham, CT (Tract ..	11

Results Data

Census tract suitability rankings
(rankings are specific to active scenario and parameters)

- Census Tract Rank (1=high suitability)**
 - Color-bar legend indicating areas of high (orange) to low (blue) suitability for DCFC charging development
- Filter by Tract Rank**
 - Only view a subset of ranked tracts (manual input or slider)
 - Example: Only view top 10 ranked census tracts in active scenario
- Highlight Census Tract**
 - Find and highlight a specific census tract within the active scenario
 - Nomenclature: County, State (Tract Number)
- Ranked Tracts**
 - View tabular results of active scenario
 - To re-organize results by census tract rank, click/hover on the "Rank" header to generate the following pop-up:

Pop-up menu options:

- Keep Only
- Sort (highlighted)
- Automatic

3365 items selected · SUM of Measure Values: 5,593,193

Rank

- Click the icon that corresponds with "Sort Census Tract ascending by Measure Values"

E-DRIVE Dashboard: Results Map

Welcome to E-DRIVE | E-DRIVE Directions | New England | Middle Atlantic | South Atlantic | East South Central | East North Central | West So

Analysis Parameters

Select State(s): (All)

Select Metro Area(s): (All)

Select County(ies): (All)

Proximity to Interstates or Highways: (All)

DCFC Plug Types Considered: All (SAE, CHAdeMO, & Tesla)

Equity Considerations

Tracts w/in Opportunity Zones (QOZ)? (All)

EPA EJSCREEN EJ Index Percentiles

State % of Demographic Index: 0 100

State % of Ozone Index: 0 100

State % of NATA Resp. Hazard Index: 0 100

Census Tract Rank (1=high suitability)

1 3,365

Filter by Tract Rank

1 3,365

Ranked Tracts

click "Rank" and select "Sort Census Tracts ascending..." to sort by rank

Census Tract	Rank
Hillsborough, NH (Tra..	1
Hillsborough, NH (Tra..	2
Hillsborough, NH (Tra..	3
Hillsborough, NH (Tra..	4
Worcester, MA (Tract..	4
Hillsborough, NH (Tra..	6
Worcester, MA (Tract..	6
Merrimack, NH (Tract..	8
Essex, MA (Tract 252..	9
Rockingham, NH (Tra..	10
Windham, CT (Tract ..	11
Barnstable, MA (Tra..	11

Note: Final tract rankings are relative and specific to the geographic scope, parameters, and metric weighting defined in the active scenario only

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Metric Weighting

Enter values to define the relative weight or importance of each metric (must sum to 100)

DCFC Proximity Metrics	Demand Metrics	Demographic Metrics	Total (must=100)
Distance: 15	Port Density: 15	Traffic Volume: 30	100
Nearby Activity: 30	Pop. Density: 5	Home Access: 5	

Results Map

Dynamic map visualizing census tract suitability rankings (rankings are specific to active scenario and parameters)

Census tracts are colored by suitability ranking of active scenario

- Orange tracts correspond with top-ranked, high suitability tracts; blue tracts are associated with tracts with lower relative suitability rankings

Census tract pop-up information

- Hover over specific census tracts to generate a pop-up box that provides detailed, tract-specific information:

Example pop-up box:

Rank: 1 (out of 3,365)

Hillsborough, NH (Tract 108)
GEOID: 33011010800

ILIT Model Metric Deciles (1-10):
 DCFC Distance: 7
 DCFC Port Density: 8
 Traffic Volume: 9
 Nearby Commercial Activity: 10
 Population Density: 9
 Access to Home Charging: 9

EPA EJSCREEN State Percentiles (max. b
 Demographic EJ Index: 100%
 Low-Income: 99%
 People of Color: 100%
 Ozone EJ Index: 99%
 NATA Respiratory Hazard EJ Index: 99%

→ *Tract ranking of active scenario and tract identification information*

→ *Metric deciles (specific to active scenario; 1=low, 10=high)*

→ *Maximum state percentile of U.S. EPA EJSCREEN EJ Index values of block group within tract*



For more information, visit www.mjbradley.com