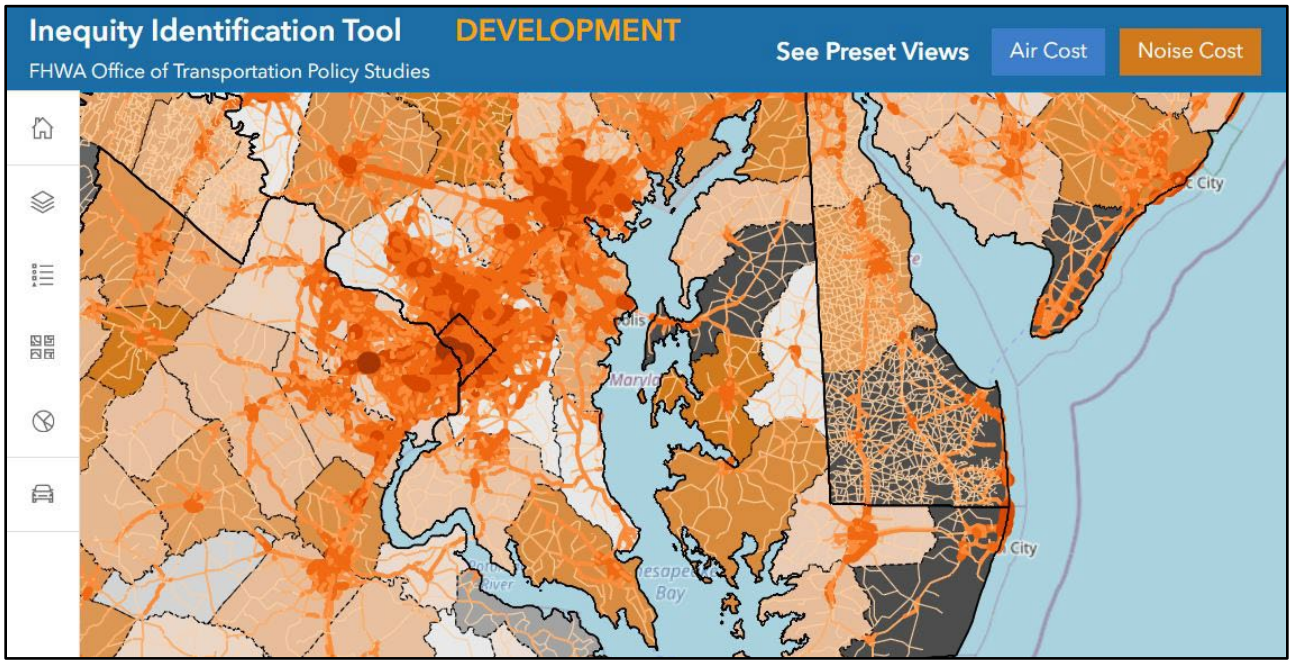
Inequity Identification Tool (Beta) User Guide



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1. Background

The Inequity Identification Tool (IIT) is an interactive mapping tool that helps quantify negative impacts from the use of the highway system including air pollution, noise, and crashes. This tool helps analysts assess social equity by conducting spatial analysis of where highway externalities occur, and the proportions of demographics affected.

2. Accessing The Externality Cost Assessment Tool

The introductory page for the IIT is located at [Inequity Identification Tool (beta) (dot.gov)](). The introductory page (Figure 1) provides a brief overview of the application, as well as additional resources. The interactive mapping application can be accessed by clicking on the blue "Access Tool" button.

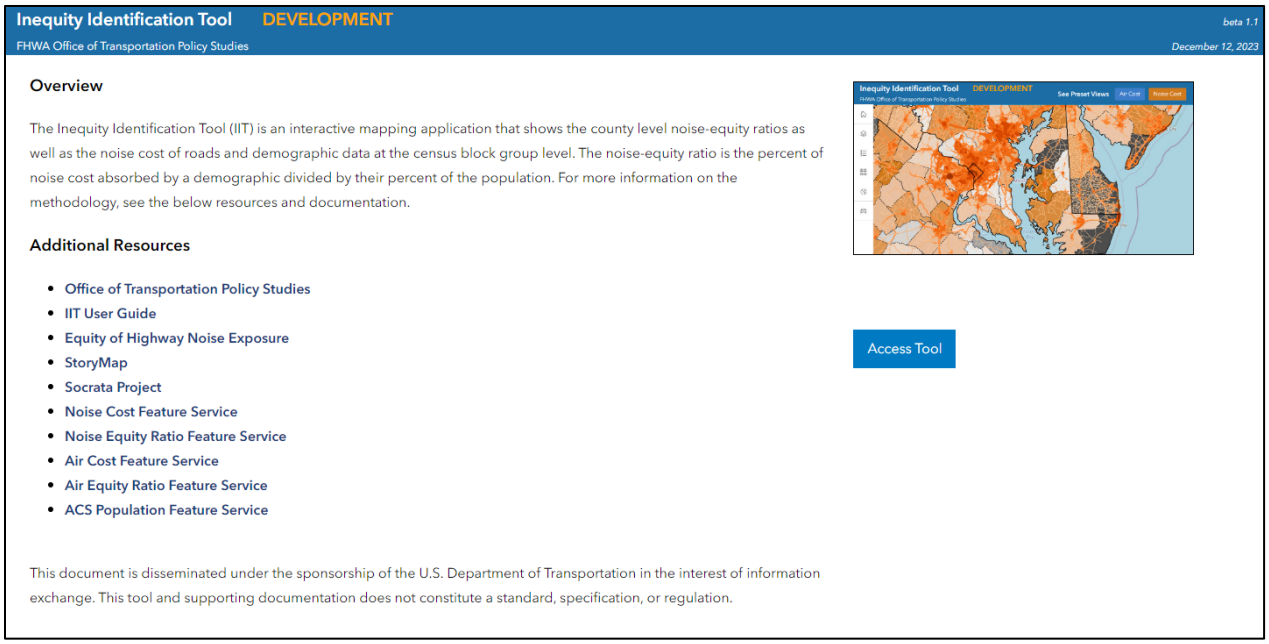

Figure 1: IIT Overview Page

3. Using the Application

3.1 Application Layout

The layout of the interactive web mapping application is relatively simple. Figure 2 shows the main sections of the application that are visible when the application first opens.

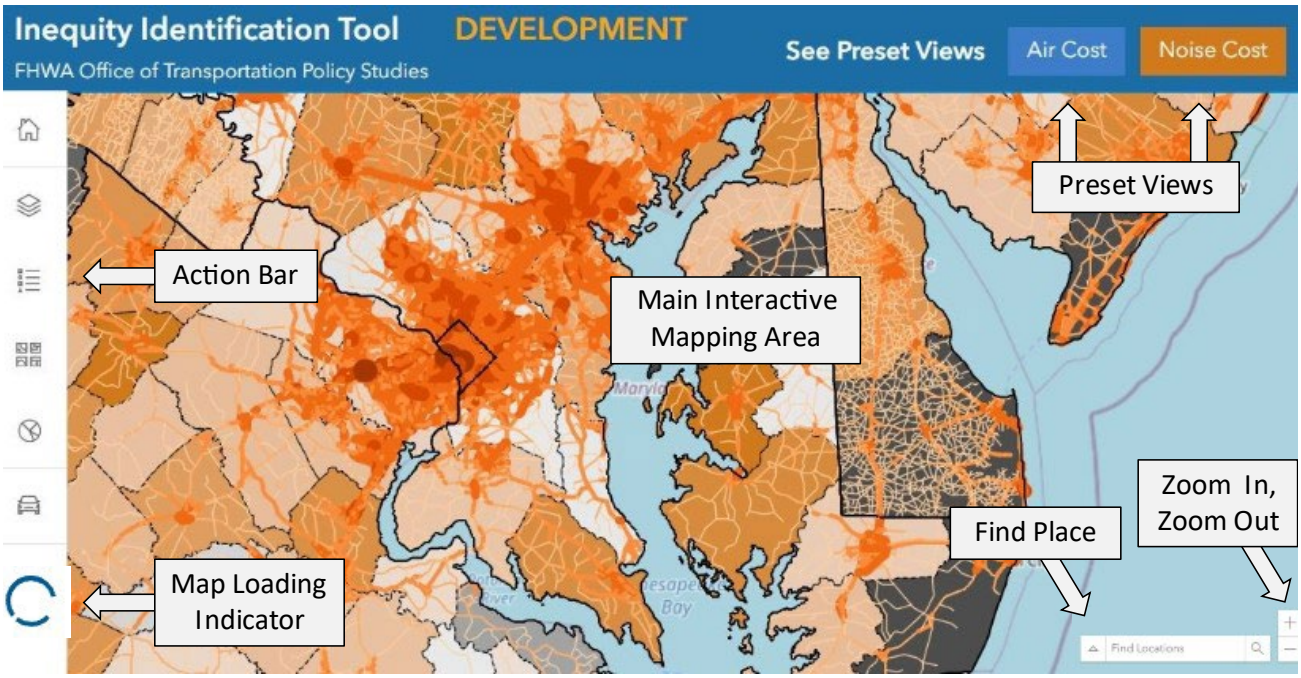

Figure 2: Application Layout

The action bar on the left is collapsed at startup and can be expanded (as shown above) by clicking on the "**>>**" icon in the lower left-hand corner of the application.

3.2 Map Navigation

The mapping application begins zoomed to the Washington D.C. – Baltimore metropolitan area. Users can interactively zoom in and out on the map in the following ways:

- Using the zoom in (**+**) and zoom out (**–**) buttons on the bottom right
- Double clicking on the map to zoom in one level, and double clicking while holding down the Ctrl key to zoom out one level
- Using the mouse scroll button, where scrolling back will zoom out and scrolling forward will zoom in
- Holding the shift button down, and drawing a rectangle on the map will zoom and recenter to cover that rectangle.

While the above ways of interacting with the map change the scale (i.e., zoom level) of the map, users can also click and drag the map to pan around at the same map scale.

To directly zoom to a specific place, the name of a place can be entered in the “Find Locations” bar in the lower right corner of the application as shown in Figure 3 below. As the user types the name, the options that match will be shown, and the user can then select the one they are looking for.

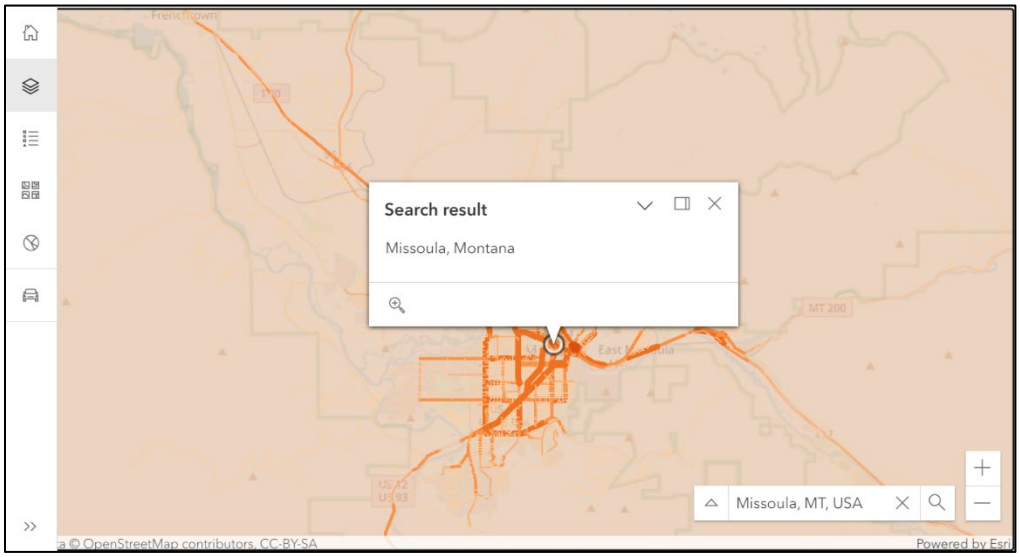

Figure 3: Zooming into a Location

In addition to zooming to a place, the up-arrow button on the left side of the “Find Location” bar can be used to select ‘Coordinates’, and then a longitude and latitude (in that order) can be entered. Figure 4 illustrates how this functionality is used to zoom to a specific coordinate.

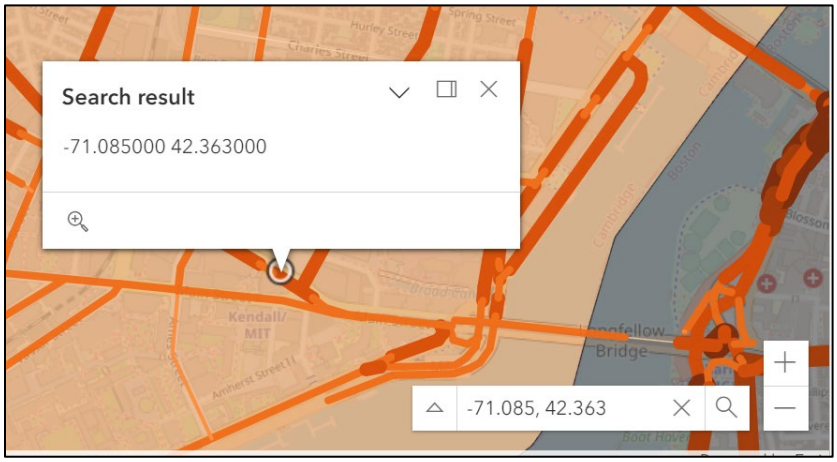

Figure 4: Zooming into a Coordinate

3.3 Preset Views

The application offers two preset views that the user can select to quickly view specified layers and symbology. The user can select a preset view by clicking on of the two Preset View options at the top right of the tool (see Figure 2.) The tool offers both “Air Cost” and “Noise Cost” as preset views. As show in Figure 5, the air cost view (on the left) displays the air cost and air equity layers, while the noise cost view (on the right) displays the noise cost and noise equity layers. Selecting a preset views resets all previously applied filters and symbology to their default state.

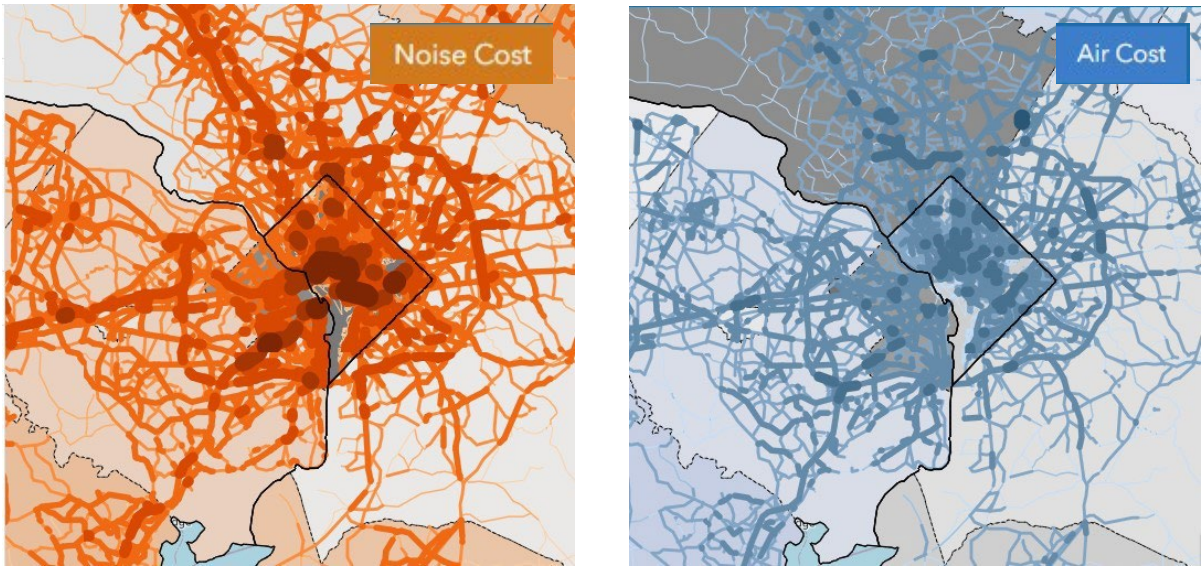

Figure 5: Preset Views

3.4 Action Bar Buttons

Figure 6 shows the action bar which contains 7 buttons, each of which will be described in detail below.

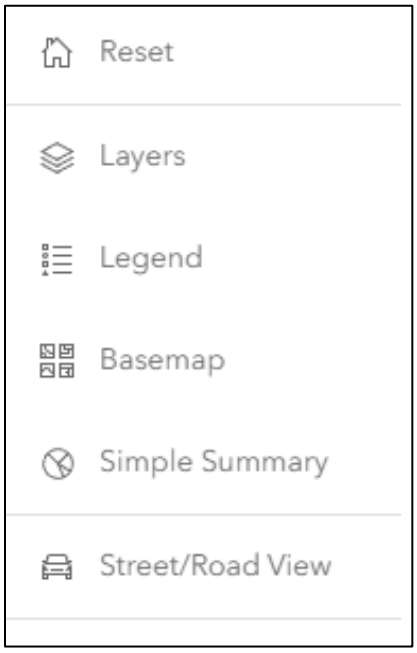

Figure 6: Action Bar

Several of these buttons open a window just to the right of the action bar. In these cases, the opened window can be closed by pressing the “x” in the upper-right corner of the window, or by pressing the same or another action bar button.

3.4.1 Reset Button

The topmost button on the action bar is the reset button. When this button is pressed, a dialog will

appear asking the user to confirm that they would like to reset the application. If 'Yes' is selected, the application is reset to its initial state. This resets the map display to its original extent and also sets visible layers and all layer queries (described below) to their initial state. An alternative to this is to press the F5 key to reload the application.

3.4.2 Layers Button

Figure 7 illustrates the Layers list that opens when the "Layers" button is pressed. The layers list has several different functionalities, each of which is described in the subsections below.

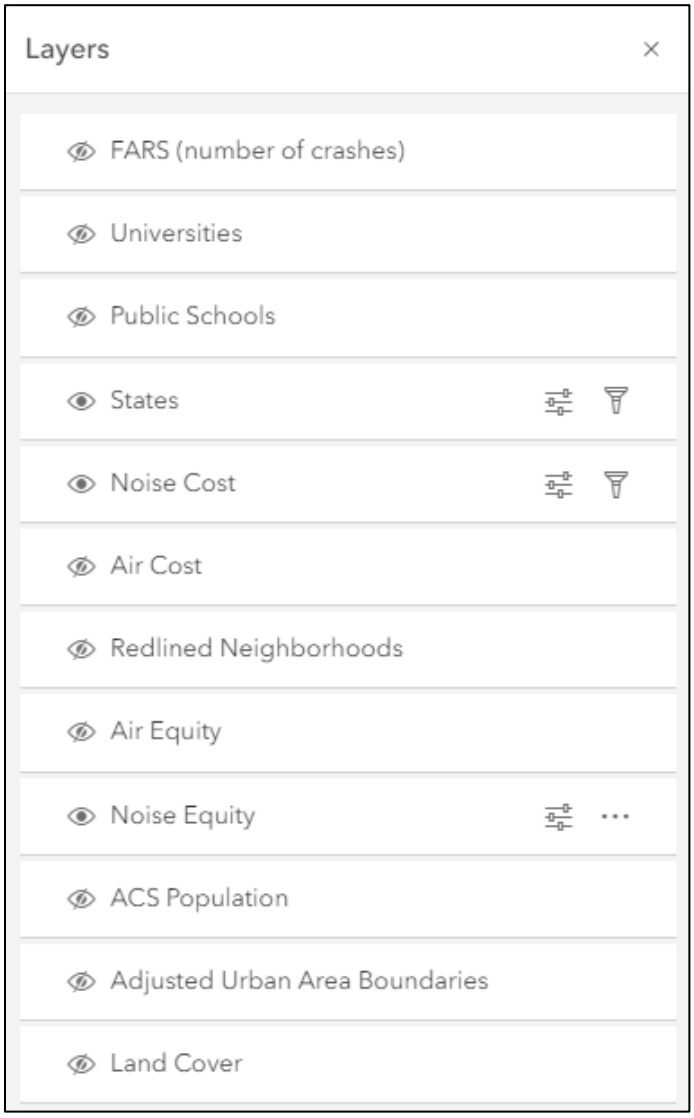

Figure 7: Layers List

3.4.2.1 Layer Visibility

The eye symbol to the left of each layer name indicates if the layer is currently visible. If the eye has a slash through it, the layer is not currently visible and if it doesn't have a slash through it, then the layer is currently visible. Clicking the eye symbol with toggle the visibility of a layer.

Some users may find it useful to quickly toggle the visibility of a layer to better understand the relations

between two layers, for example if both neighborhoods and regions are set to be visible, the neighborhoods layer can be quickly turned on and off to better understand the relationship between neighborhoods and regions.

3.4.2.2 Layer Order

There are times when a user may want to change the order of layers. This can be done by clicking and holding a layer name and dragging the layer up or down.

3.4.2.3 Layer retrieval

When zooming in and out, layers will adjust (e.g., fill in) to the displayed extent. Layers are retrieved from a server and can take a few seconds to fully download. Figure 2 shows the location of the map loading indicator. This indicator will spin while the application is still downloading layers and will disappear once all layers are downloaded. Occasionally the download of layers can take longer due to internet or server delays.

Many of layers that are available in the tool are very large, for example block groups are based on over 72,000 Census tracts and selected demographic information is also included in the layer. Since the intent of the tool is to allow users to compare different areas, there are no limitations on when layers are visible, for example, some applications may only allow Census tracts to be drawn when zoomed in to approximately a state level scale. As a result, if users don't apply layer filters (see section 3.4.2.5 below) and zoom out too far, the application will request large amounts of data from the server and data download limitations may be reached. Figure 8 shows a screencapture where block groups have not been filtered in any way and the map is zoomed to a large part of the United States. In the image, the map loading indicator has stopped, yet all neighborhood types have not drawn. For this reason, the application starts zoomed into a specific area. It should be noted that with recent improvements in the underlying Esri software, this problem in not occurring nearly as frequently as in early beta versions.

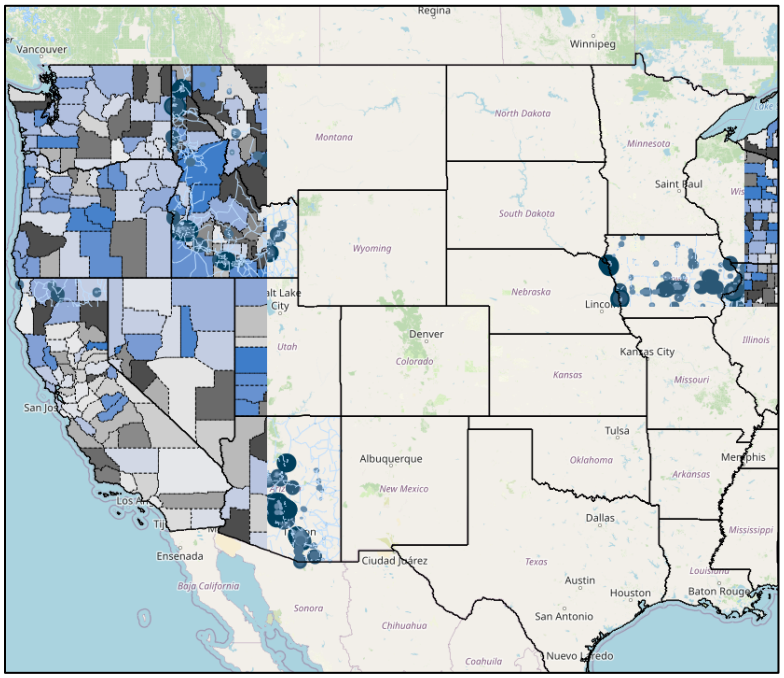

Figure 8: Missing Census Tract

3.4.2.4 Layer Clustering

Unlike other layers, the FARS (Fatality Analysis Reporting System) layer uses dynamic clustering, which groups individual crash points into clusters that dynamically change size as the user zooms in and out. Figure 9 below shows 77 fatal crashes in the Washington, DC area, while the more zoomed in Figure 10, shows the dynamically generated clusters are more broken apart. It should also be noted that the 77 crashes in Figure 9 clearly represent crashes from outside of Washington, DC since Figure 10 shows that the number would be closer to 20 within the city's boundaries.

Figure 9:Clustering Zoomed Out

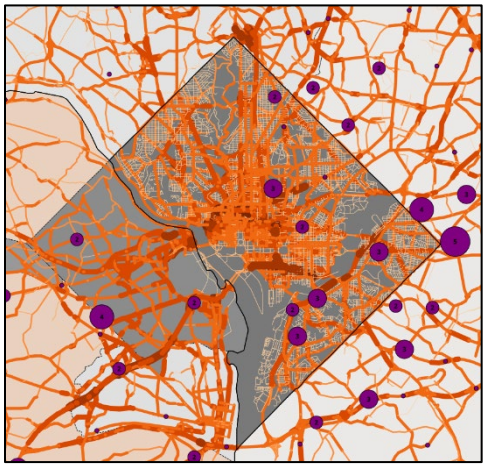

Figure 10: Clustering Zoomed In

3.4.2.5 Layer Filtering

One of the most powerful features of this application is that the various layers can be quickly filtered to gain meaningful insights. Filters can be applied to visible layers by clicking on the filter/funnel icon to the right of the layer name. Figure 11 shows an example of a layer specific filter dialog that opens when the filter icon is clicked.

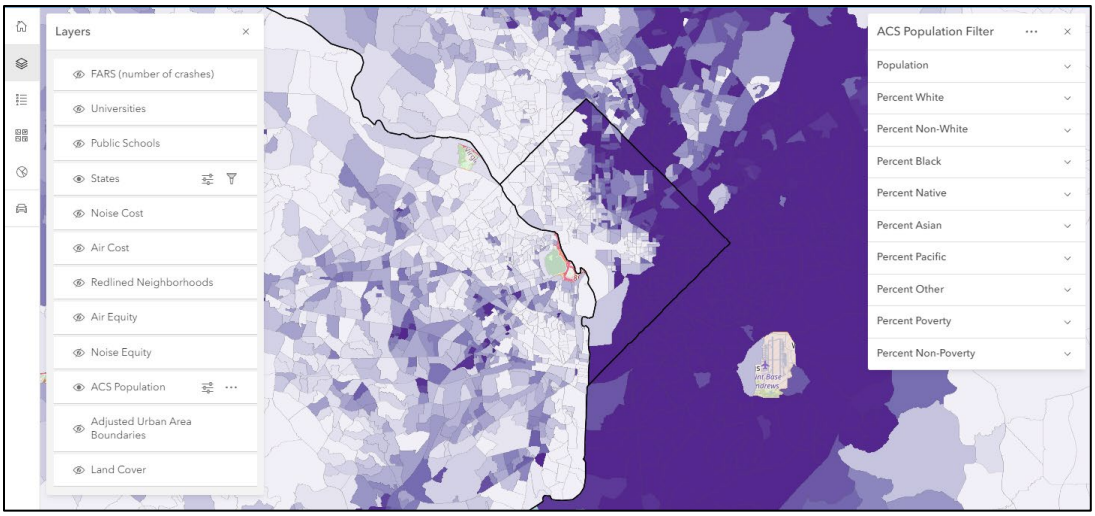

Figure 11: Layer Filtering

Users can then choose from any of the available filters. Figure 12 illustrates filtering to only show census tracts with 51% or higher of the population is non-white.

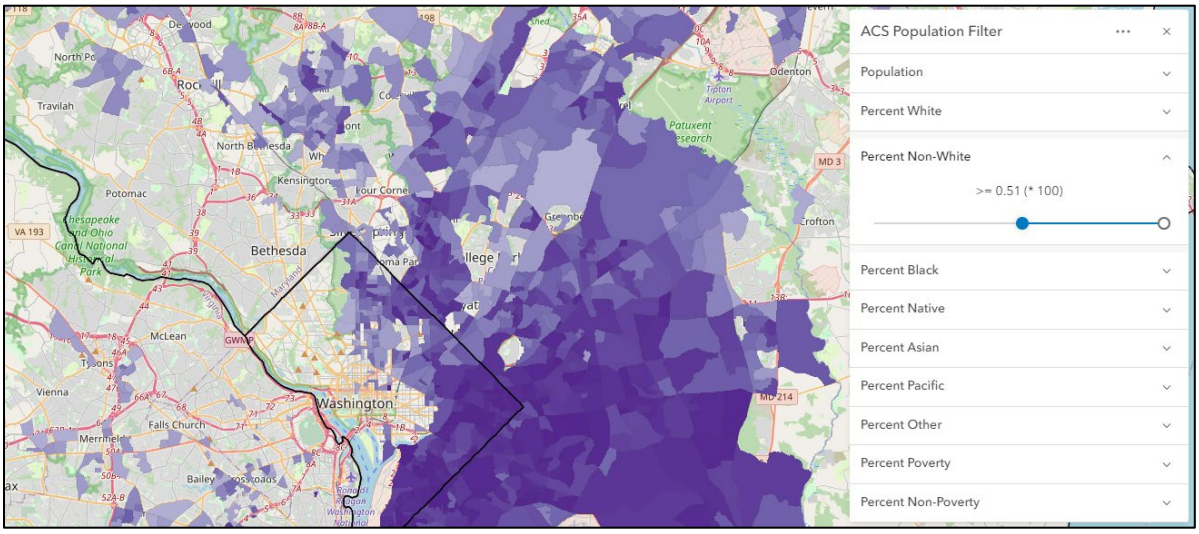

Figure 12: ACS Population (Census Tracts) Filtered by Percent Non-White

Similarly, Figure 13 shows the application of filtering the Noise **Cost** layer based on roadway functional class.

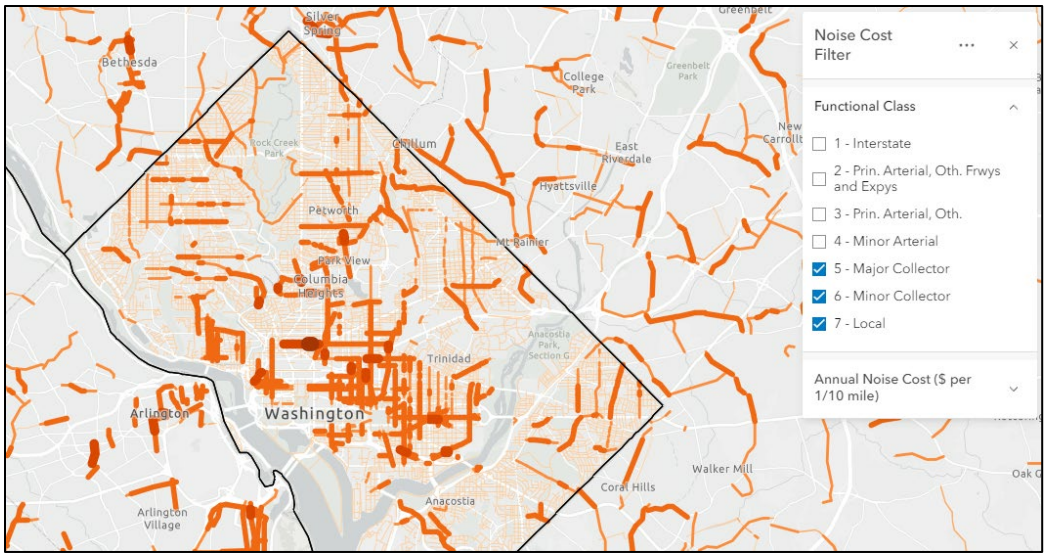

Figure 13: Noise Cost (From Roadways) Filtered by Functional Class

Figure 14 – If multiple filters are applied, the filters are combined using 'and'. For example, this means that if an additional filter based on the annual noise costs is added to Noise Cost layer, in addition to the functional class filter from Figure 14, the result is a query like "(functional class in (5,6,7)) and (annual noise cost <= $100,000)". It is not currently possible to use "or" in filters (e.g., functional class in (5,6,7) and annual noise cost <= $100,000).

As multiple filters are set, it can be difficult to keep track of all the filters that have been applied. By clicking the ellipses in the upper right corner of the layer filter, two additional buttons are shown (Figure 16).

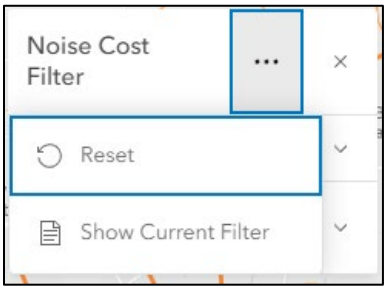

Figure 14: Reset and Show Current Filter

The "Reset" button resets all filters in the layer to their default value.

Figure 15 shows an example of the modal dialog box that is displayed when the "Show Current Filter" button is pressed. This shows the actual SQL query that is being applied to the layer, something that may be of interest to some users.

Figure 15: Show Current Filter

Some layers cannot be filtered. The Adjusted Urban Area Boundaries layer cannot be filtered because no additional attributes have been included at this time as its primary purpose is to simply show areas defined as being urban. Filtering on the land cover layer has not been implemented at this time and the layer simply serves as an alternate base map.

The filter for the states layer behaves slightly differently because its primary purpose is to filter the other layers by state. Figure 16 illustrates an example where Massachusetts and New Hampshire are selected in the states filter and other visible layers, noise equity, and noise cost in this example, are automatically filtered to these states as well. The land cover layer is not currently filtered by states.

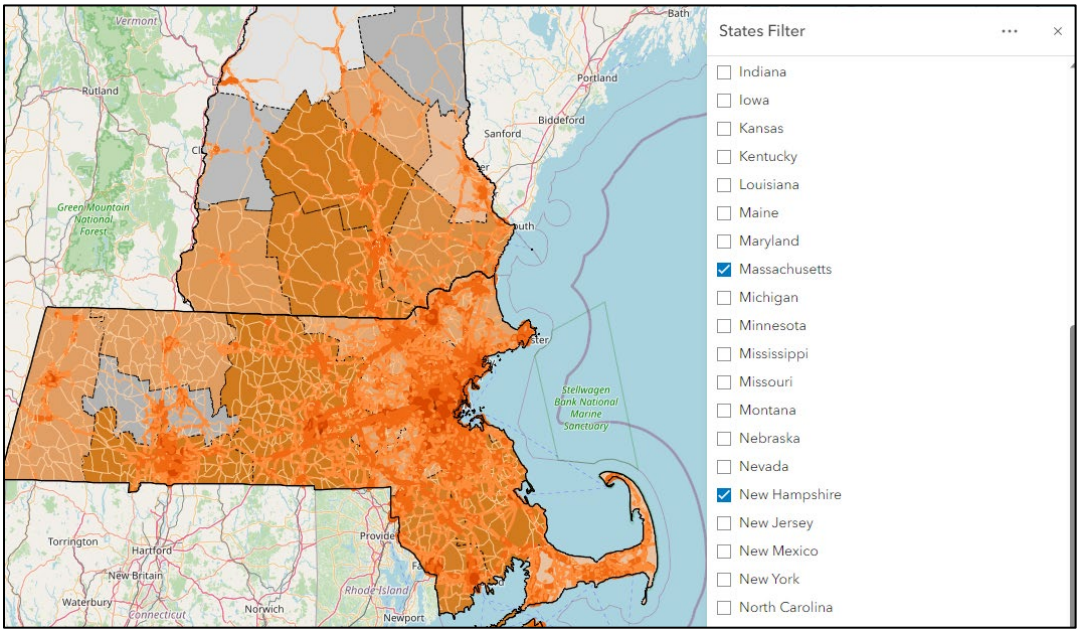

Figure 16: Filtering by State

3.4.3 Layer Symbology

Certain layers can also have their symbology adjusted. The layers that have symbology options are Noise Equity, Air Equity and ACS Population. Symbology options can be accessed by clicking the three dots to the right of the layer name to expand the layer options, then clicking the symbology button that appears under the layer name.

With this tool, the symbology function allows users to select which demographic group the layer reflects. In the case of the Noise Equity Ratio shown in Figure 17, if the user selects Non-White as the layer demographic, then the layer will display the Noise Equity Ratio for Non-White populations. For all layers with a symbology option, the default demographic is Non-White.

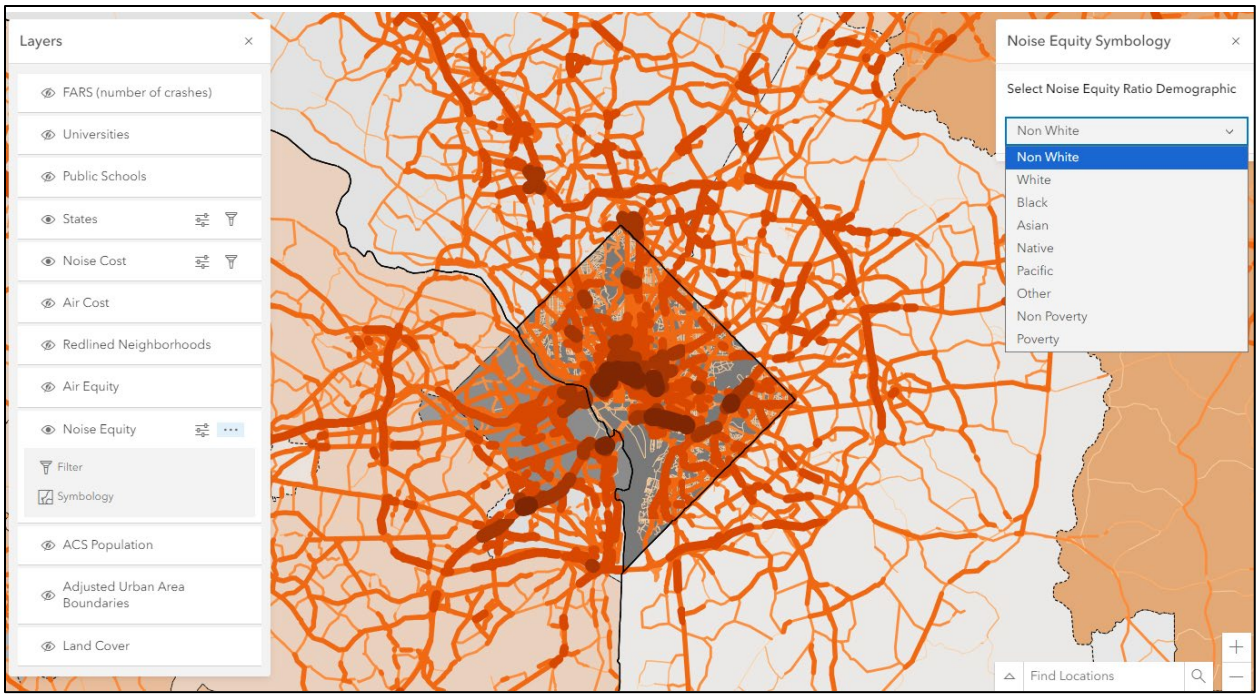

Figure 17: Noise Equity Symbology

3.4.3.1 Layer Transparency

The transparency of layers can also be changed. The transparency slider button is located to the right of each visible layer in the layer list. Figure 18 shows an example where both the ACS Population and the FARS layers are made more transparent to add additional context with the basemap. Users should be aware that applying transparency on layers can make it difficult to interpret the map symbology.

It should also be noted that in some cases, when trying to use the transparency slider, the entire layer may be dragged as if the user was trying to change the layer order, an issue which may be related to screen resolution. If this occurs, a suggested work around is to change the transparency by clicking at locations along the slider rather than trying to drag the slider.

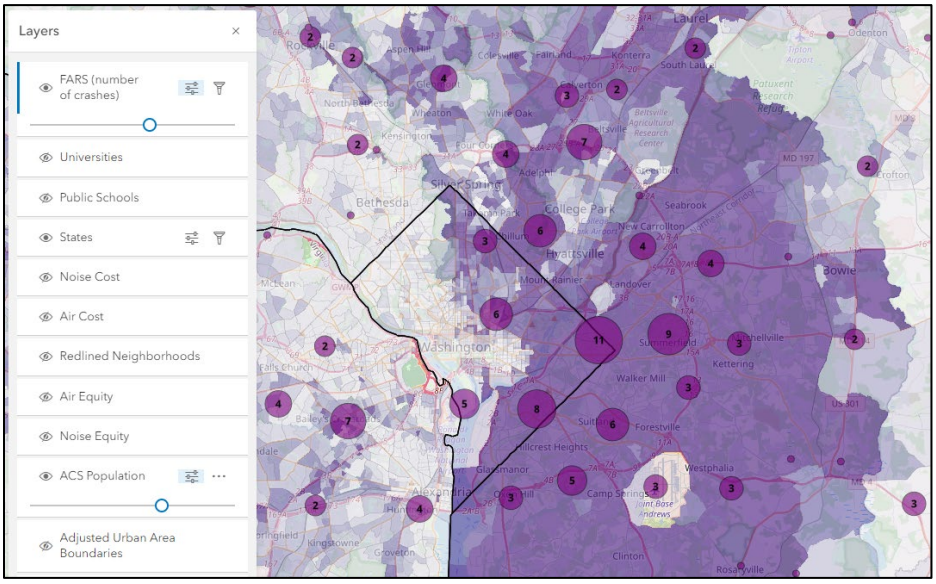

Figure 18: Layer Transparency

3.4.4 Legend Button

When the legend button is clicked as shown in Figure 19, it opens a map legend which shows the layers which are currently set to be visible. It should be noted that while the legend shows all categories for the layer, it doesn't mean they all appear in the current view.

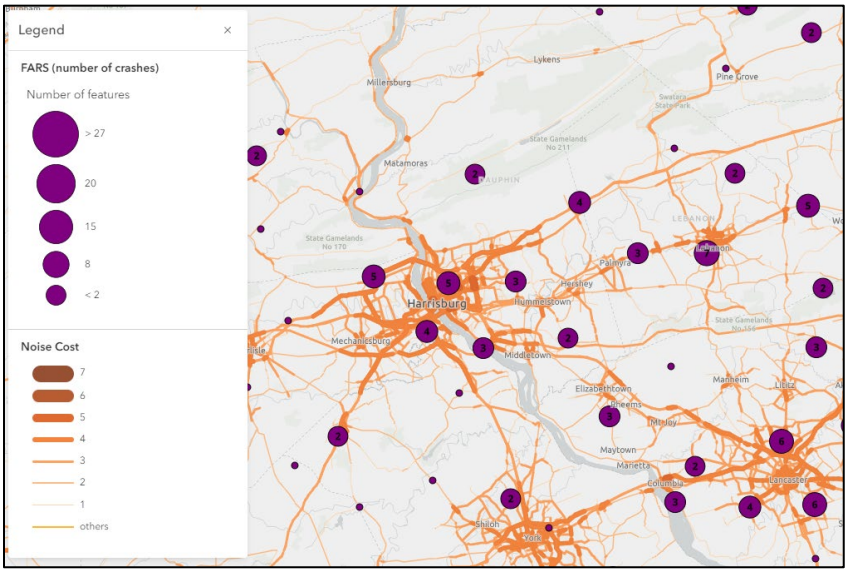

Figure 19: Legend

3.4.5 Basemap Button

Several basemaps are available in the application and changing the basemap, for example from a street map layer to an imagery layer can provide additional insight. Figure 20 shows and example of changing to the "Imagery with Labels" basemap.

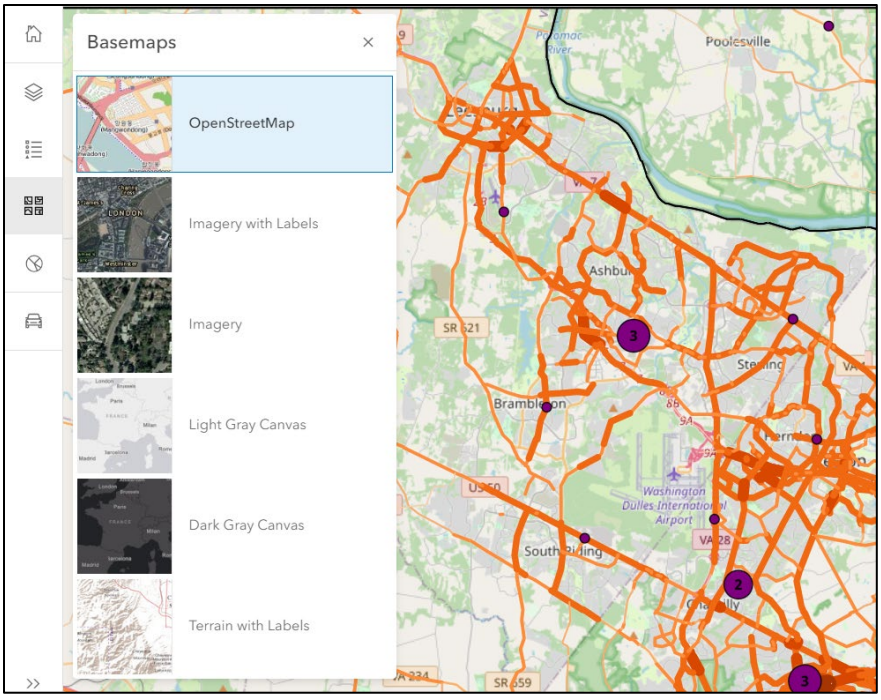

Figure 20: Changing the Basemap

3.4.6 Simple Summary

The Simple Summary functionality allows users to see selected statistics for the area currently being shown on the map. Figure 21 shows the Non-White Population, FARS fatalities, the average Noise and Air Cost, and the Total Noise and Air Cost experienced by Non-White populations. It should also be noted that the statistics and chart also reflect any filters that have been applied, so if for example, a filter was applied to only show roadways of functional class 5 or higher, then the noise and air cost values would only reflect cost from those roadways.

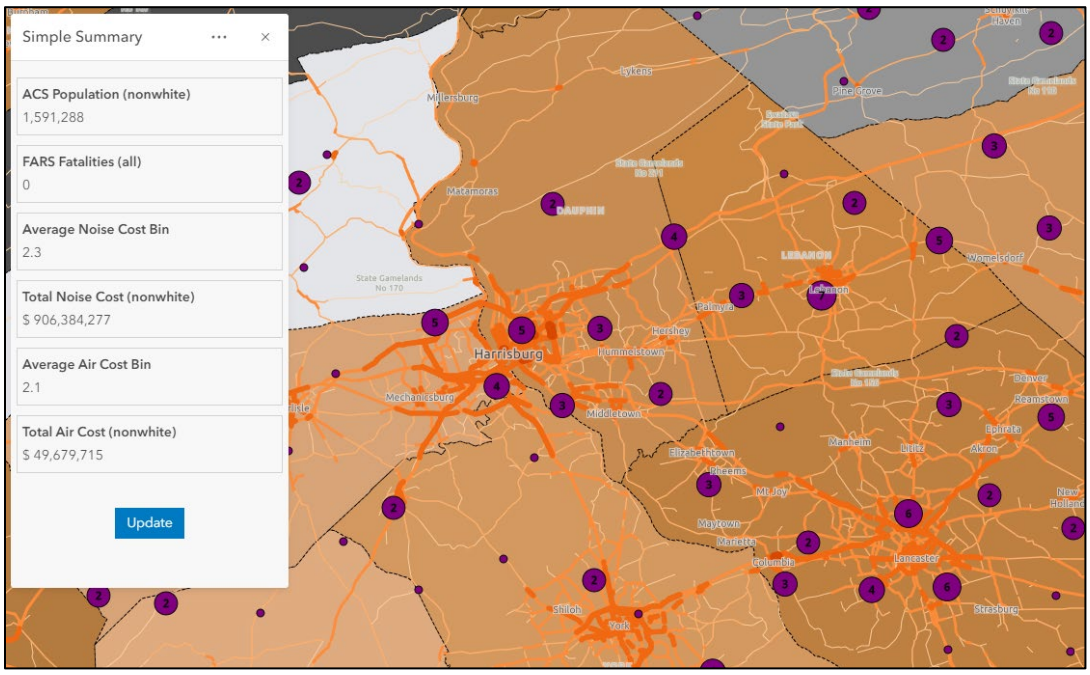

Figure 21: Simple Summary Example 1

Figure 22 illustrates an example where the Air Cost and Air Equity layers have been turned off. Because numbers are derived from the features on the map, NHS Mileage and FARS Fatalities cannot be determined when the layers aren't visible.

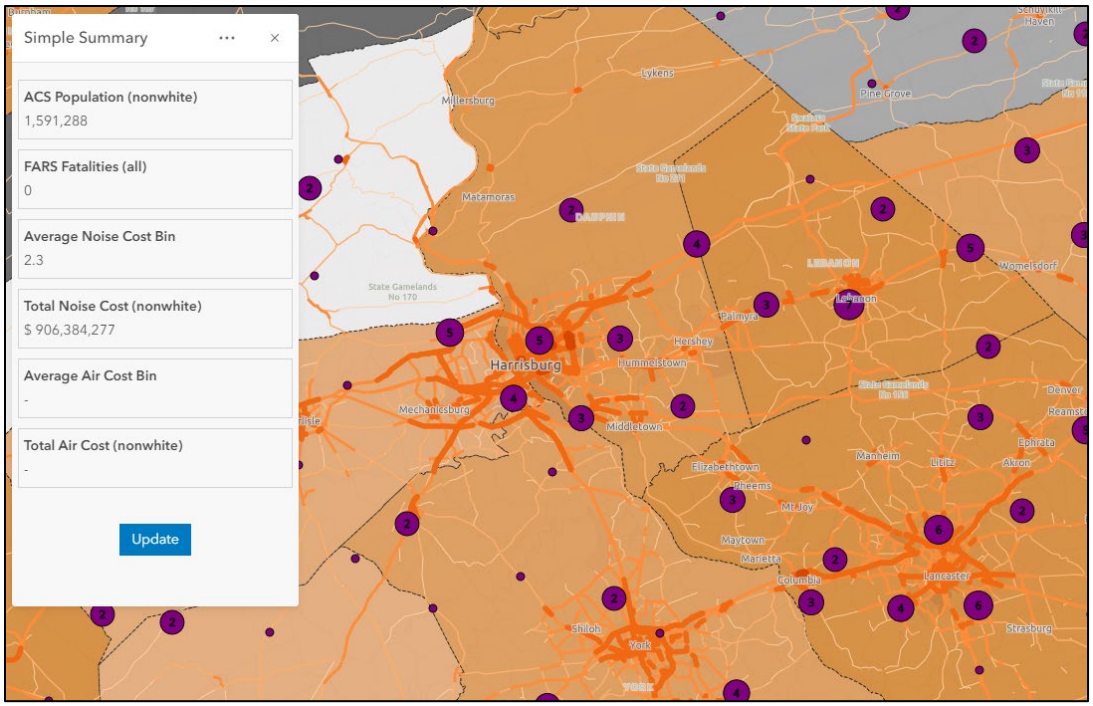

Figure 22: Simple Summary Example 2

3.4.7 Street/Road View Button

The street/road view option on the menu allows users to quickly open Google Maps, in Street View Mode, at a selected location. To do this, the user should click on “Street/Road View” button in the action bar, at which point the button should appear selected and the user should see a message that says “Click on a Road” next to the pointer when hovering over the map (Figure 23).

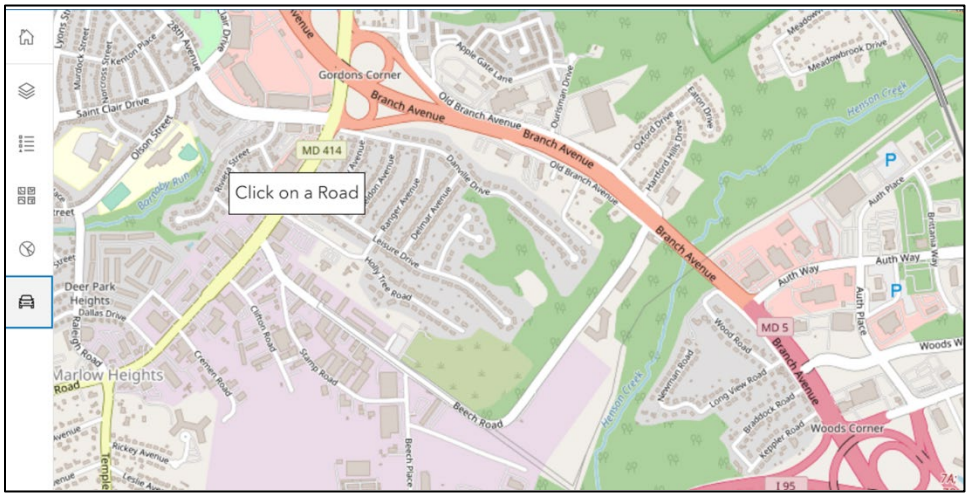

Figure 23: Street/Road View Button

When the user then clicks on the map, for example on route MD 414 near Raleigh Road in Figure 24, a separate Google Maps tab opens in the browser.

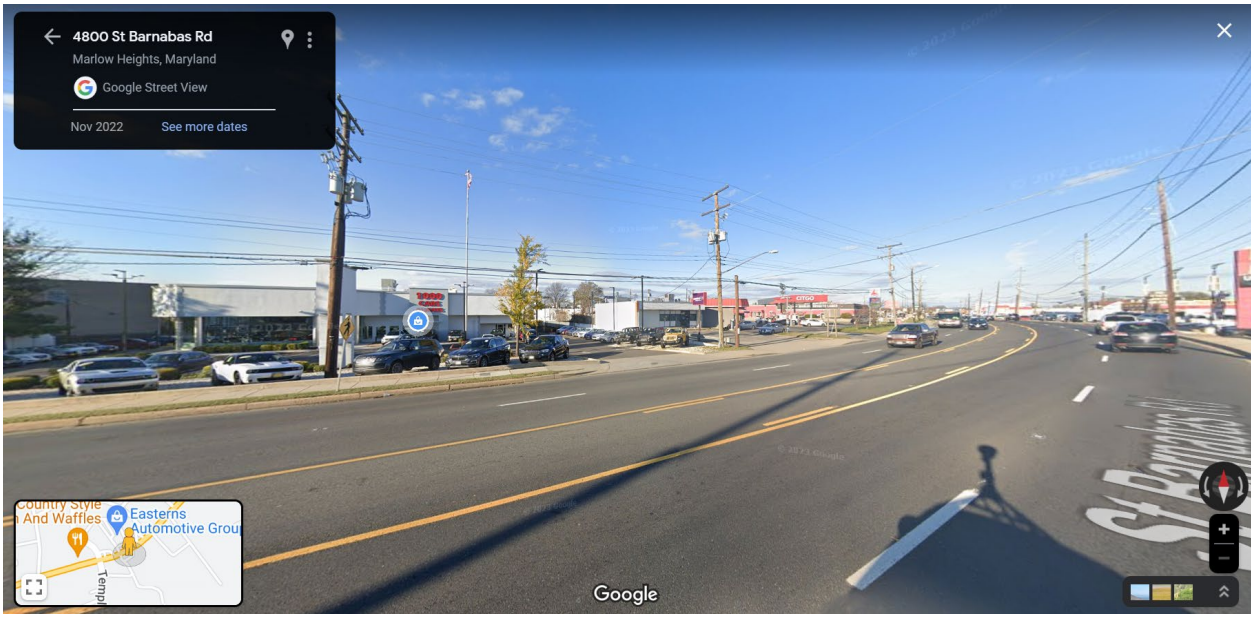

Figure 24: Google Street View

If a user clicks on an area that is not close to a road (e.g., in the green area northwest of Branch Ave in Figure 24), the Google Street View will appear black as in Figure 25 below. If the user still wants to explore the area, they should use the back arrow (i.e., left pointing arrow) in the upper left corner of the Google Street View page to return to the standard Google Map view of the area.

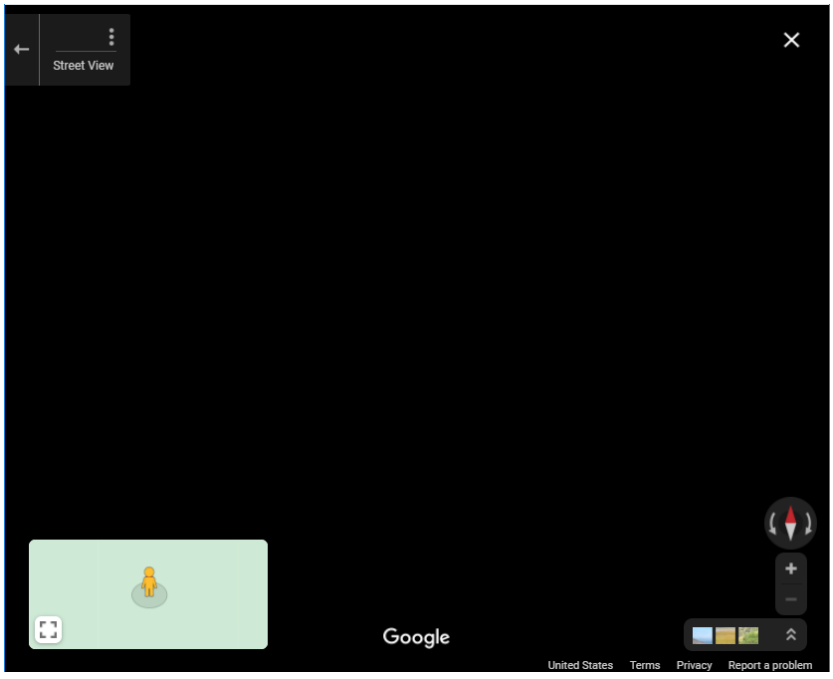

Figure 25: Black Google Street View

The Street/Road View functionality only works while the Street/Road View button is highlighted. For example, if a user was to use Street/Road View functionality and then clicked the legend, a mouse click on the map would no longer open Google Street View. This helps to prevent users from wanting to click on layers for information and inadvertently opening a Google Steet View tab instead.

4. Contacts

Please direct all questions and comments to Viktoriia Dunleavy at Viktoriia.Dunleavy@dot.gov or Thor Dodson at Thor.Dodson@dot.gov.