The Resilience Analysis and Planning Tool (RAPT) is a geographic information systems (GIS) tool to help emergency managers and community partners at all GIS skill levels to visualize and assess potential challenges to community resilience.

This **User Guide** provides in-depth information on RAPT functionality and step-by-step instructions on how to use all the features.

Access RAPT at https://bit.ly/ResilienceAnalysisandPlanningTool.

RAPT includes multiple data layers:

- **Infrastructure** information drawn from the Homeland Infrastructure Foundation-Level Data (HIFLD)[1] Subcommittee, such as fire station and hospital locations.
- **Hazards,** such as seismic and flood risk.
- The 20 **Community Resilience Indicators** identified in the Community Resilience Indicator Analysis: County-Level Analysis of Commonly Used Indicators from Peer-Reviewed Research: 2019 Updates (CRIA) conducted by FEMA and Argonne National Laboratory. All 20 indicators include county data; 12 also include census tract data.

GETTING STARTED

Accept the User Agreement

The initial splash page shows a user agreement on a map of the continental United States with black outlines of states and lighter gray outlines of counties within states. Accept the user agreement each time to gain access to RAPT.

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[1] The HIFLD Open data portal contains national foundation-level geospatial critical infrastructure data in the public domain. You can access HIFLD Open at https://hifld-geoplatform.opendata.arcgis.com/.

Intro Screen Left Side: Information and FAQs

The left side of the initial screen provides Frequently Asked Questions (FAQs) and direct links to the following additional resources (all available at https://www.fema.gov/media-library/assets/documents/176618):

- **RAPT Overview** – A one-page introduction to RAPT.
- **RAPT Data Layers and Sources** – A complete list the data layers and their sources of information. Click on and off data layers to explore potential challenges to resilience and community resources.
- **Community Resilience Indicator Research Summary** – Detailed information on each community resilience indicator, including its connection to resilience, data source, national average, and binning method.
- **CRIA Correlation Analysis** – Describes how individual community resilience indicators may be related to each other. Communities can design resilience strategies that take these relationships into account.

NAVIGATING THE MAP

You can move around the map and explore areas of interest. The initial view shows the continental United States, but you can move to other areas, such as Hawaii, Alaska, or Puerto Rico. Navigate with the following:

- **Location:** Type the name of a specific county, city, or state in the search bar.
- **Zoom:** Click the +/- boxes at the top left of the map to zoom in or out on a map location.
- **Home:** Use the home button to bring the map back to the initial view.
- **Mouse:** Use your mouse to move the whole map or click on a specific county.

At the Top: Navigation Bar Icons

These icons are along a top navigation bar. Depending on your browser and your webpage's zoom level, some of the icons may be hidden – in that case, you will see a "More" button to reveal the additional icons.

Click the "More" icon if your browser hides some icons
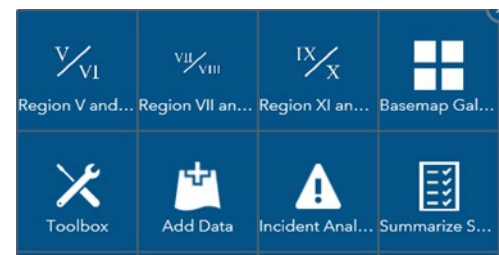
Overview and Methodology
Includes background information about the methodology to identify the 20 community resilience indicators and implications for emergency managers.

Resilience Indicator Connection to Resilience
Provides the data source and national average for each indicator and how researchers connected each indicator to community resilience.
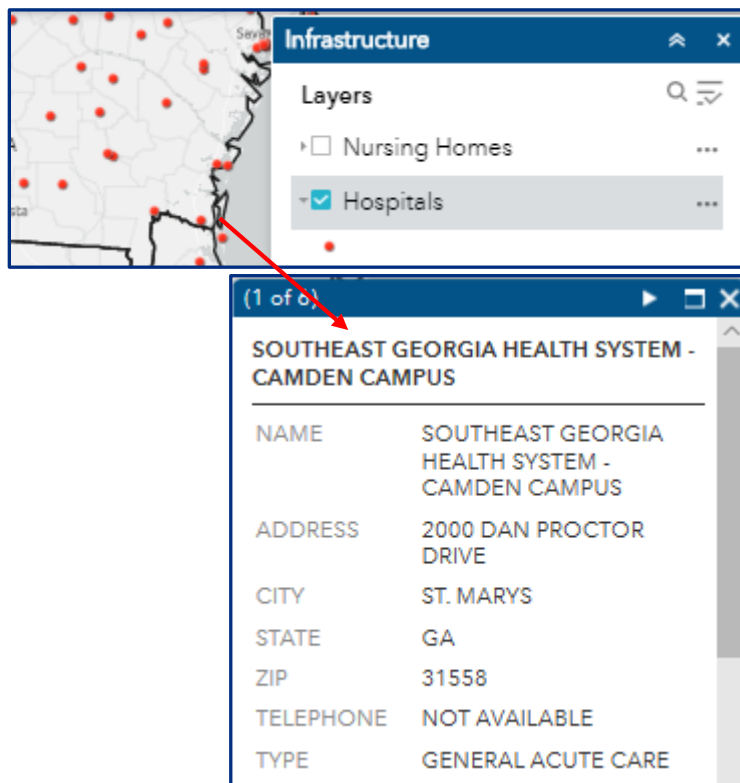
Legend
Helps you keep track of all the layers (hazard, infrastructure, county and census tract indicators) you may have open on the map.

Infrastructure

Shows community infrastructure points available through the Homeland Infrastructure Foundation-Level Data (HIFLD).

- Click on the name of the infrastructure layer to see how that data will appear on the map (the shape and color of the datapoint).
- Click on the box next to the infrastructure layer and the datapoints will appear on the map.
- Click on a datapoint and a pop-up box will appear with the information HIFLD has available.
- Click the "x" in the top right of the pop-up box to close it.

Hazards

Shows GIS layers of historical hazard data for tornadoes, tropical storms, and wildfire; risk assessments for seismic and flooding events; and real-time watch and warning notifications from the National Weather Service.

- NOTE: Because the dataset is so large, FEMA's National Flood Hazard Layer will only populate on the map when the area shown on the screen corresponds to an altitude of 10,000 feet or lower. Flood maps are not available for all counties.
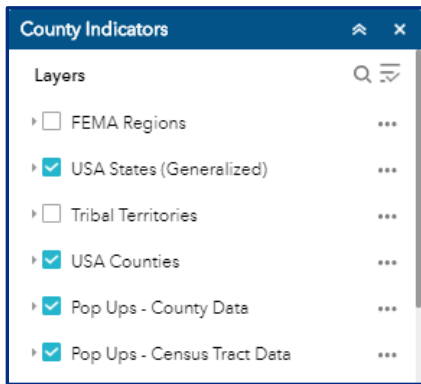
County Indicators

Includes all 20 community resilience indicator layers identified in the CRIA with data at the county level. Twelve of these indicators also have census tract data provided as a separate layer (see right).

Click on the County Indicator icon to see the list of all the layers available with county-level data. The top of the list shows several additional layers that you can toggle on and off. These include layers that highlight FEMA region, state, tribal, territory, and county boundaries. State and county boundaries are turned on by default.

Two additional layers are turned on by default:

- Pop-Ups - County Data
- Pop-Ups – Census Tract Data

Population-Focused Indicators	Community-Focused Indicators
CRIA Commonly Used Indicators	**CRIA Commonly Used Indicators**
% Population without Health Insurance*	Connection to Civic/Social Organizations
% Population Unemployed*	Hospital Capacity
% Population without a High School Education*	Medical Professional Capacity
% Population with a Disability*	Affiliation with a Religion
% Population without Access to a Vehicle*	Presence of Mobile Homes*
% Population with Home Ownership*	Public School Capacity
% Population over 65*	Population Change
% Population Single-Parent Households*	Hotel/Motel Capacity
% Population with Limited English Proficiency*	Rental Property Capacity*
Median Household Income*	
Gini Index: Income Inequality	

Available with both county and census tract data

With these functions toggled on, when you click on the map, the pop-up box includes a tab with county data for all 20 indicators and a tab with the available census tract datapoints. Toggle these layers off if you find them distracting by clicking the checkmark next to each indicator's name.
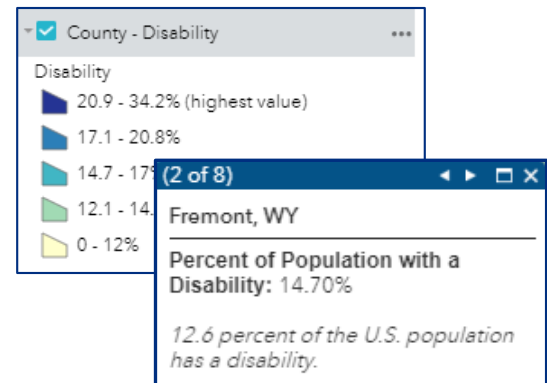
- Scroll down inside the pop-up box to see the full list.
- Use the white arrows in the blue header to click through the tabs of the pop-up.
- NOTE: If individual indicators have also been selected, that datapoint will have a separate tab, along with the national average.
- **NOTE: The Pop-Ups County and Census Tract MUST be on for some tools (e.g. Population Count, Query Tool) to function correctly.**

You can display the County Indicators data by color-coded bins.

- Click on the title of the desired layer, and a legend will appear below the layer name. The county indicators are organized into five bins, with the darker colors indicating potential greater challenges to resilience.
- NOTE: Refer to the legend for each indicator to see the data ranges for each bin/color.
- Toggle indicator layers on, and the bins will populate the map. Review the [Community Resilience Indicator Research Summary](#) for more information on the binning methodology.
- If multiple layers are toggled on, the map will only display the colored bins for the indicator that is highest on the drop-down list.
- Click on a county for a pop-up box of that county's data and the national average for that indicator.
- If "Pop-Ups - County data" and/or "Pop-Ups – Census Tract data" are toggled on, you will also see tabs with the full set of 20 of indicators and/or the available census tract datapoints.

Census Tract Indicators

Twelve community resilience indicators are available with census tract data. They are grouped into five tabs, with two FEMA Regions in each tab, for faster loading of data.

- Click on the appropriate icon for the desired Region set (some could be in the expanded icon set, depending on your settings – click MORE ▤) to access them):

- At the top of each census tract tab list is the FEMA region layer. Click on this layer to add labels and outlines of the states in each FEMA region.
- Similar to the County Indicators tab, click the name of the indicator to see the legend showing its data bins. Darker colors denote greater challenges to resilience. Census tract data is grouped into 7 bins to allow greater differentiation across this much larger dataset.
- If multiple layers are toggled on, the map will only display the colored bins for the indicator that is highest on the drop-down list.
- Click on a census tract for a pop-up box with information on the selected indicator data.
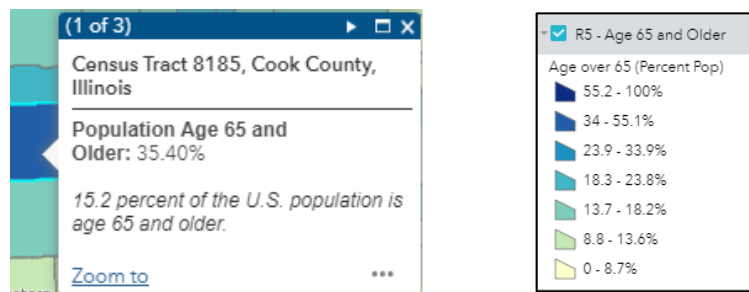

Basemap Gallery

The Basemap Gallery allows you to change the display of the base map. The default map is the Light Gray/Canvas; other options include satellite imagery, street maps, and terrain views. The street map view is especially helpful to assess evacuation routes, and the terrain views are useful when looking at hazards such as flood or wildfire.

Toolbox

The Toolbox opens in the upper-right corner of the screen. It contains three tools to help visualize areas on the map: Draw, Print, and Measurement.
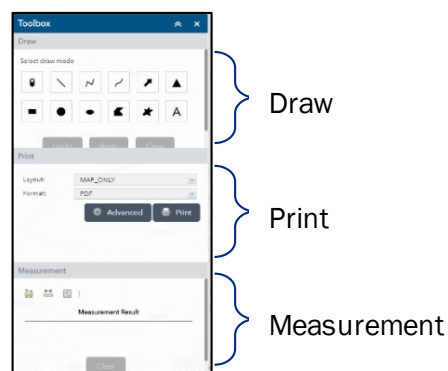
- **Draw:** The Draw tool lets you create graphics that display on the map (single points, lines, polygons, etc.). It can also display measurements for drawn features, such as length, area, and perimeter.

 – To draw an object, select the shape of the object you wish to draw.
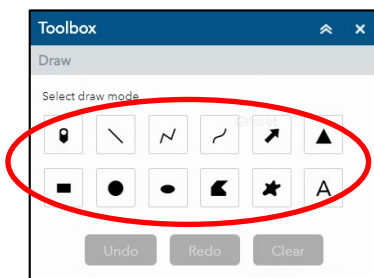
  – Once you select the shape you want, formatting options will appear below that allow you to adjust the color and transparency of the figure and include measurements (depending on the type of image).
  – Use the drop-down for "Show area measurement" to select the unit of measurement.
  – Change the font size depending on preference.

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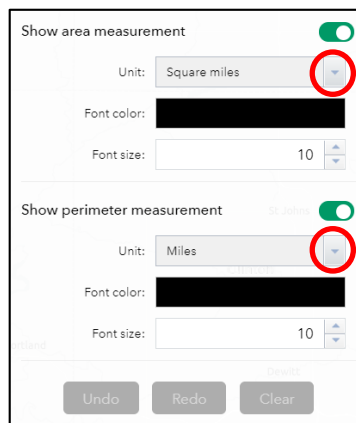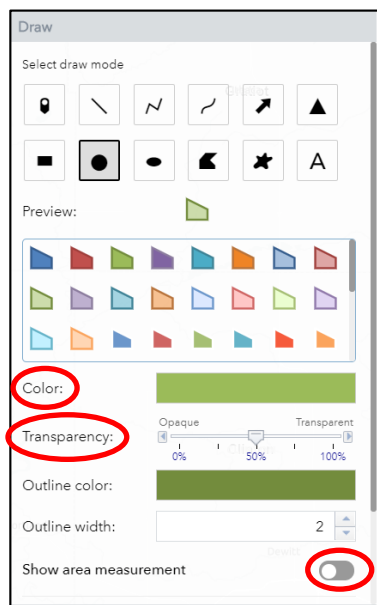
— After you select the shape and choose the formatting, move your cursor to the map. A pop-up box will appear with instructions on how to draw the shape.
— You can have multiple shapes on the map. To draw additional shapes after your first, go back to the Select Draw Mode, select your next shape and follow the previous steps.
— You can undo the most recent drawing and clear all drawings by clicking the "Undo" or "Clear" buttons at the bottom of the formatting box.
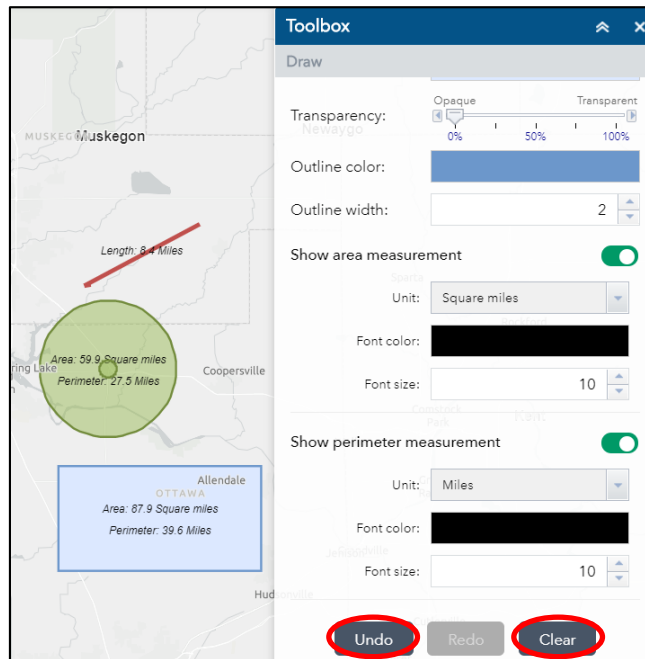

— **NOTE: Drawings are not saved when you exit the application. They remain on the map until you click "Clear" or refresh your browser.**

• **Print:** The Print function lets you save a PDF of the map on your screen.

— NOTE**:** The PDF will only show the extent of the map that's visible on your display, and the map will automatically include the legend of any data layers that are turned on.
— Click the "Print" bar in the Toolbox and select layout and format preferences from the drop-downs.
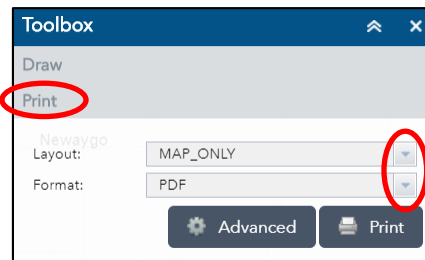
- Click the "Advanced" button to modify various aspects of your map, including labels, map size, and print quality.
- Click "Print" and your map will save as a PDF and open in another browser tab.
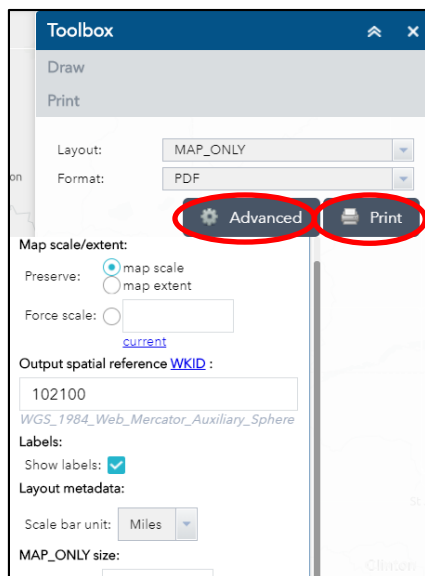

- **Measurement**: The Measurement tool lets you create polygonal shapes and straight lines while providing the square miles or distance as you draw your shapes. It can also provide latitude and longitude values for a specific point on the map.

  - NOTE: The Measurement tool differs from the Draw tool in that it allows you to see the area of a polygon or the length of a line you are drawing while you're using the tool. This is useful for potentially determining the distance between events and infrastructure, geographical landmarks, or the affected radius of an event.
 - Click on the "Measurement" bar located below the "Print" option in the Toolbox.
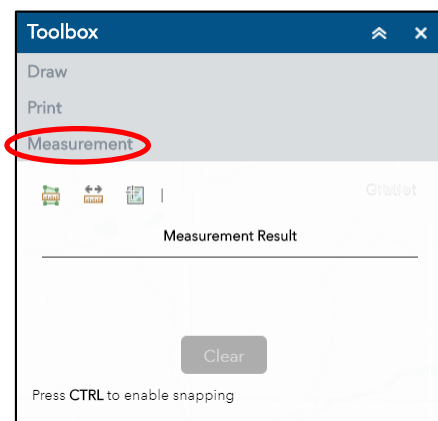
- To draw a polygon and measure the area within the polygon, click the "Area" icon.
- Click on points on the map to determine the corners of your polygon.
- Double-click the final corner of your polygon and the shape and area will appear.
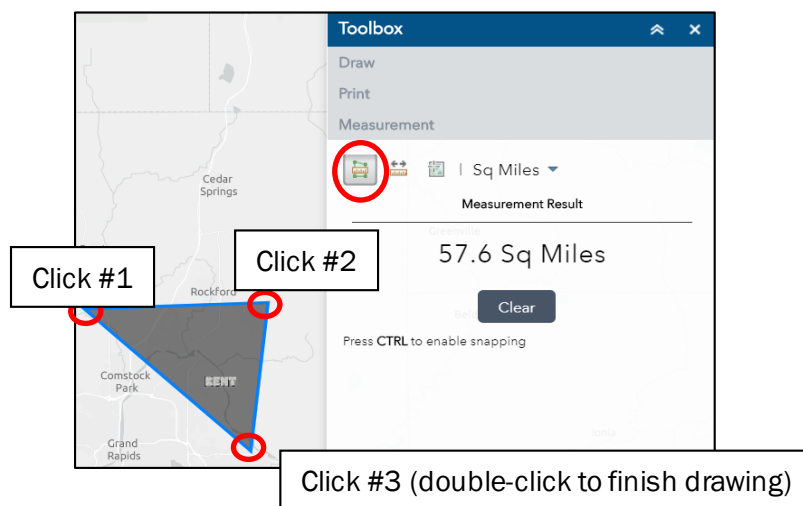
- To draw a line and measure the distance of the line as you draw, click on the "Distance" icon.
- Click a point on the map as the start point of your line. As you move your mouse from that point, the distance will display under the "Measurement Result" section.
- Double-click the final point of your line and the total distance will appear.
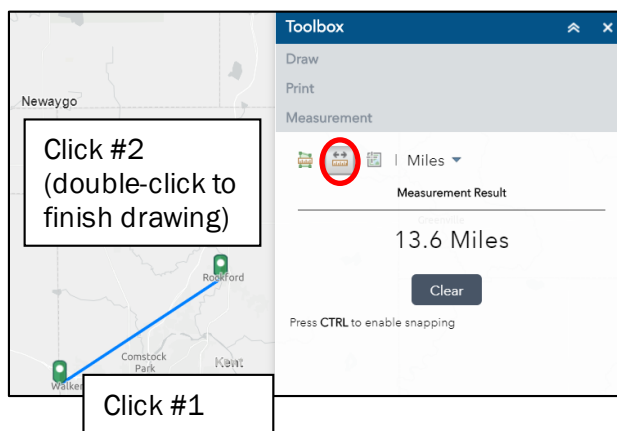
- To see the latitude and longitude values of a specific point on the map, click on the "Location" icon.
- Click the map at the desired location and the latitude and longitude values will display under "Measurement Result" section.
- As you move your mouse, the latitude and longitude values for your mouse location will display next to the mouse icon.
- If you click on a new location in the map, the latitude and longitude values will change to display the new location.
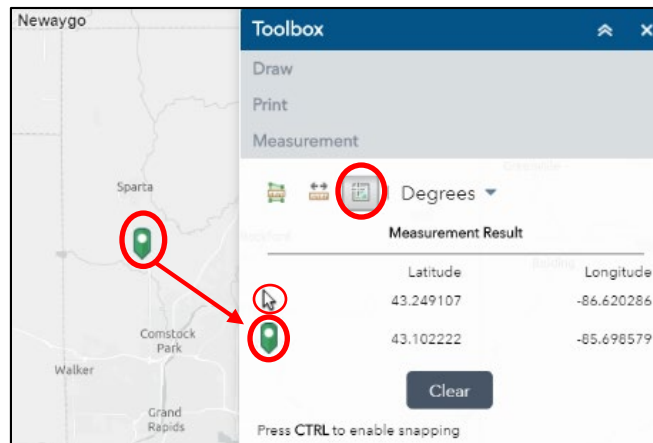

Add Data

The Add Data tool allows you to add data to the map by searching for layers hosted on ArcGIS Online or on a Portal for ArcGIS, entering URLs to data sources, or uploading local files (appropriate data types include a zipped shapefile, KML, CSV, GPX, or GeoJSON). You can temporarily add layers to and remove layers from the map, but **these layers cannot be saved to the map** to be retained for future review.

Incident Analysis Tool

The Incident Analysis Tool allows you to create a buffer zone around an incident (single point, linear, and polygonal) and identify and visualize infrastructure entities within this zone. This tool can provide a comprehensive list and visuals of the locations of infrastructure entities within the buffer zone.

- Click on the Incident Analysis Tool icon and the tool will open at the bottom of the page.
- Create an area around your incident by clicking on the desired type of buffer (single point, linear, or polygonal).
- Set the buffer distance by moving the scale to the desired distance or clicking inside the box, typing the desired value, and hitting "Enter."

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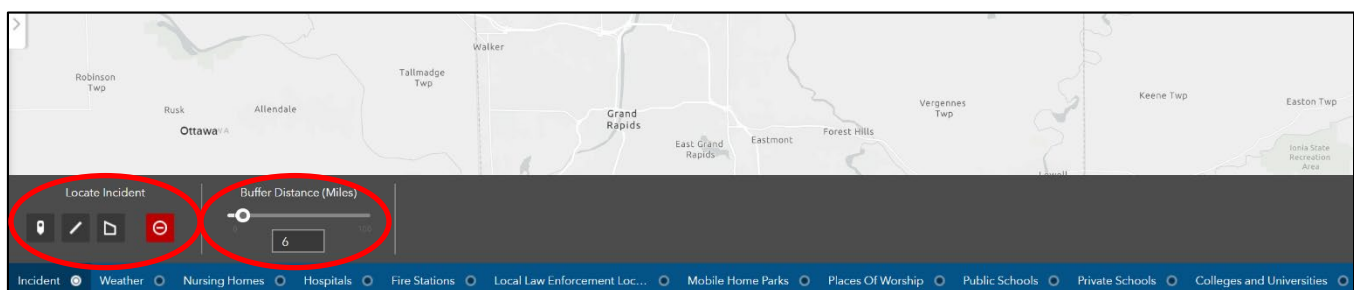
- Click on the map to draw the buffer zone. The map will zoom to the affected area.
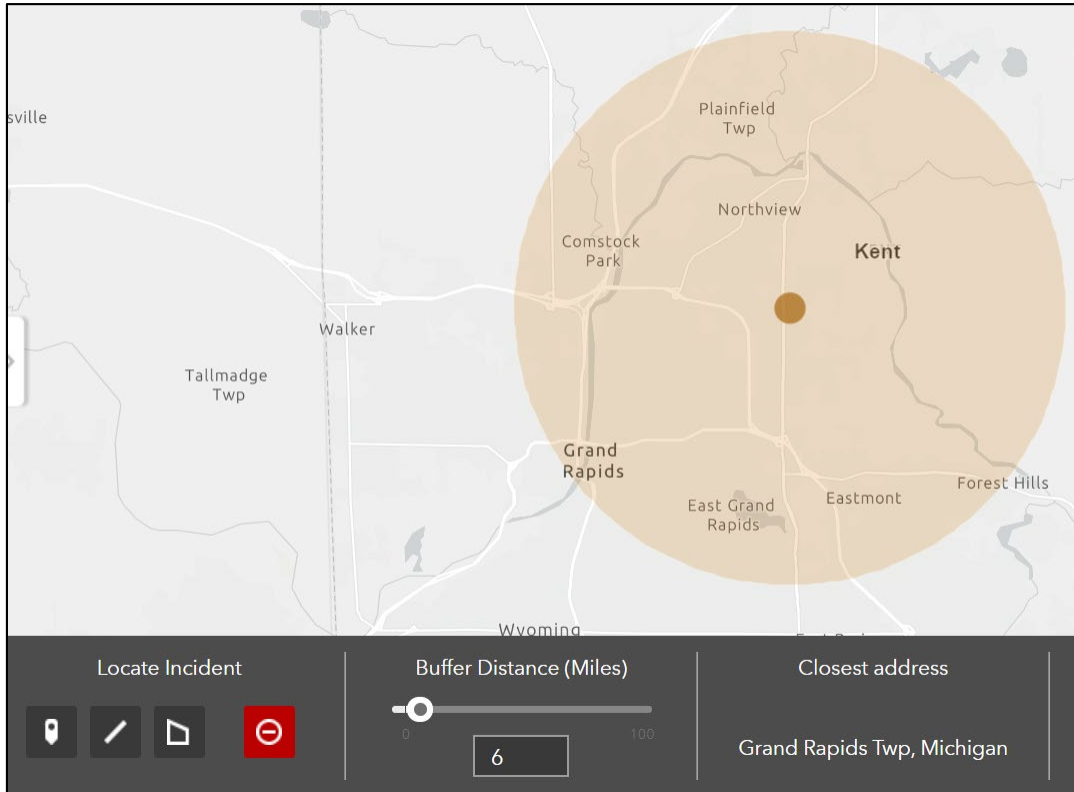

- Once the buffer zone is drawn, select infrastructure entities by clicking on the infrastructure name.

  – NOTE: Infrastructure entities are listed in order of closest to furthest from the center of the buffer zone. Only the infrastructure entities in the buffer zone will be listed, although the map will show all infrastructure entities outside the buffer zone as well.
  – NOTE: You can only select one infrastructure layer at a time, but the buffer zone will not disappear as you toggle between layers.
  – NOTE: You can only create one buffer zone at a time.
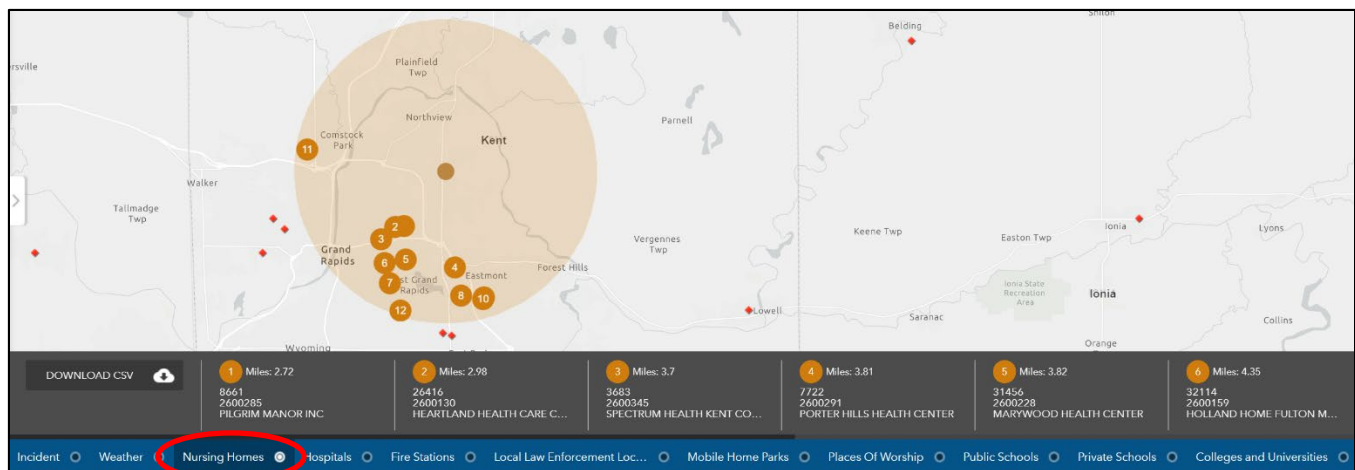
- To export the list of entities, click on "DOWNLOAD CSV" and the list will open in Excel.
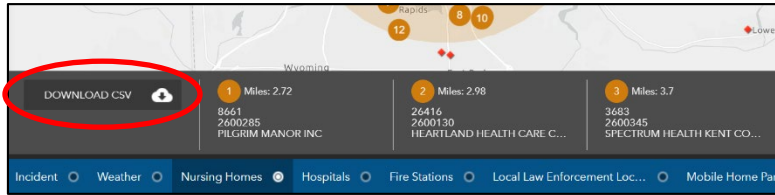

- To erase the current buffer zone and create a new one, select "Incident" and click the red box.
- Once you erase a buffer zone, the entities on the map and the list will disappear.
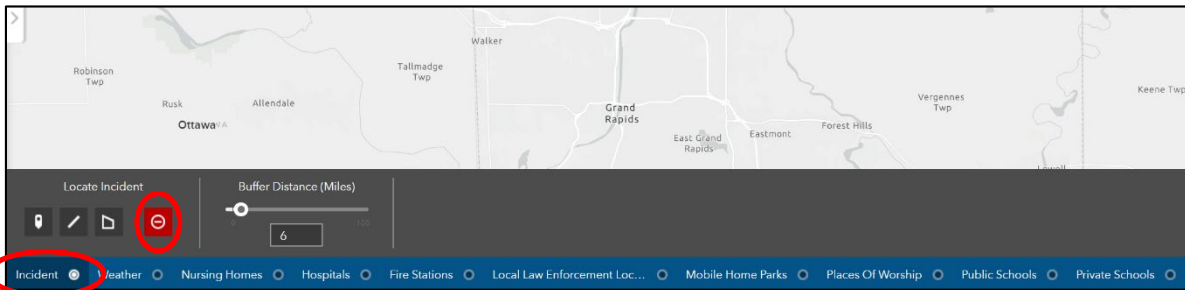
Summarize Selected Indicators Tool

The Summarize Selected Indicators Tool allows you to draw a specific shape on the map (circle, rectangle, polygon etc.), select all the census tracts within or touching that shape, and calculate the population of individuals with specific resilience indicator characteristics (age over 65, disability, unemployment, etc.) in those selected census tracts. This tool can provide a visual and comprehensive list of census tracts located in the shape, as well as the total number of individuals with your desired indicator characteristic.
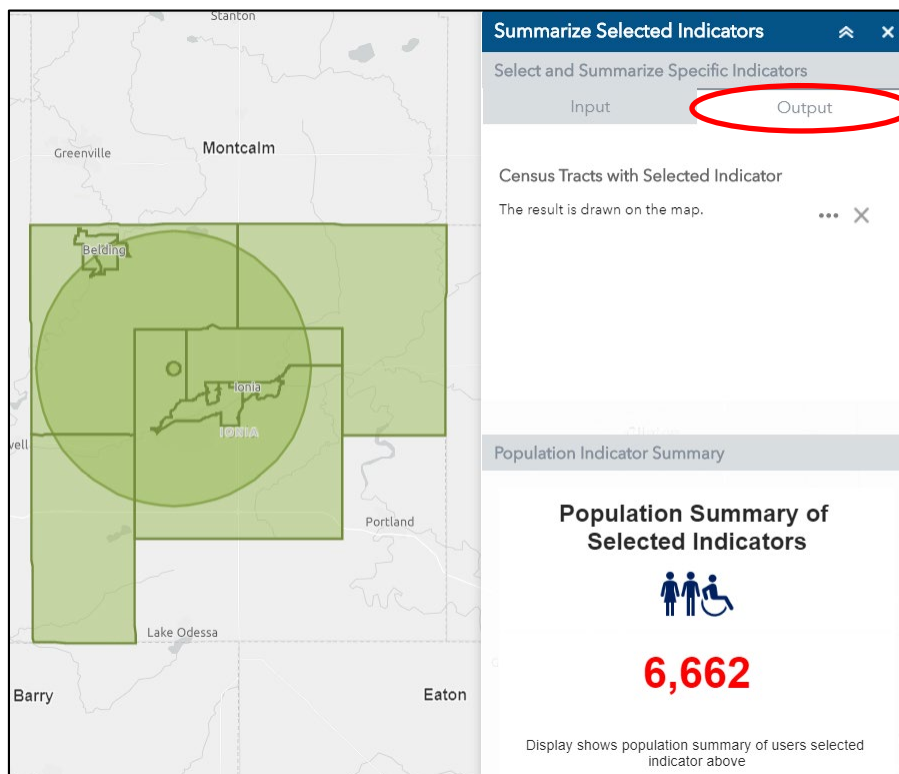
- Click on the Summarize Selected Indicators icon in the upper-right corner.
- The Summarize Selected Indicators tool opens on the right side of the page. Click the desired shape (triangle, rectangle, circle, etc.).
- Place your mouse over the map after selecting the shape, and a box appears with instructions on how to draw the shape.
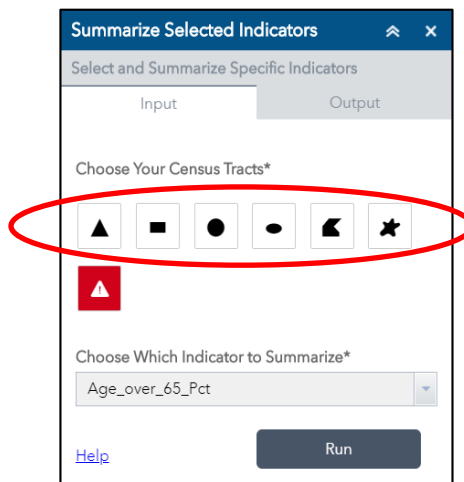
- After drawing the shape, select the indicator characteristic you wish to summarize from the drop-down list and click "Run."
- NOTE: You may have to scroll down slightly to see the "Run" button, depending on your browser display settings.
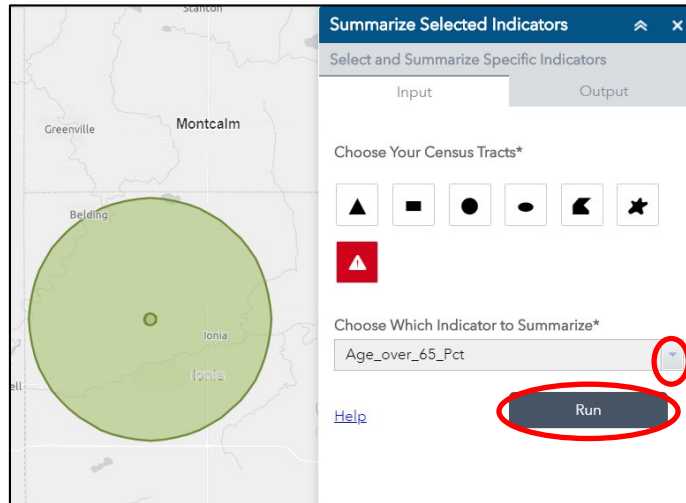

- The tool will take you to the "Output" tab, produce a visualization of the all the census tracts within or touching the shape, and show the number of individuals with the selected resilience indicator characteristic in the "Population Indicator Summary" section.
- In the example below, the number of individuals over the age of 65 within the selected census tracts is 6,662, displayed in the "Population Indicator Summary" section.


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- To export, save, or view this information in the Attribute Table, click the three dots under "Census Tracts with Selected Indicator" and select the desired action.
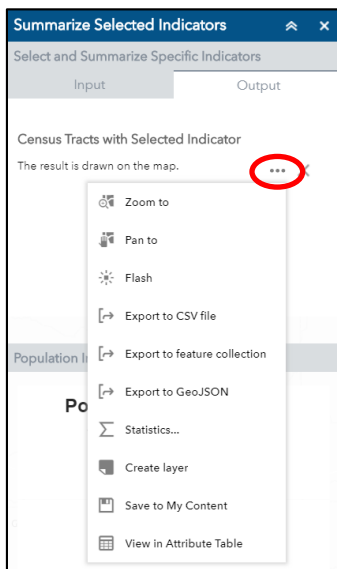
- To maintain the same area of analysis but summarize a different indicator characteristic, click on the "Input" tab in the tool, select the new indicator characteristic from the drop-down list, and click "Run."
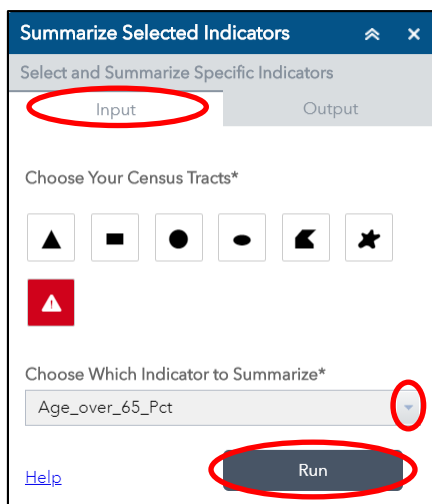
- To select a different area for summary, click on the "X" to clear the results in the "Output" tab, go to the "Input" tab, and start the tool with a new area.
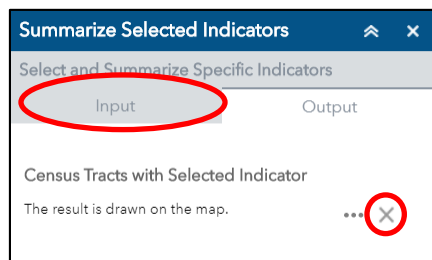
At the Bottom: The Attribute Table

You have the option to "View in Attribute Table" for all infrastructure, hazard, and indicator features in RAPT.

- Click the dark grey tab at the bottom of each web page to open the Attribute Table for all the indicators currently selected. A window will pop up showing data in a table format.


- Initially, the table will include only the counties and census tracts displayed on the screen (within the extent of the map on the screen). To include all counties and census tracts in the database, deselect "Filter by Map Extent."
- From the Attribute Table, you can download data into an Excel document, sort by name/title, and filter by state or county.

The table has columns for all of the CRIA resilience indicators (all 20 with the county data, as well as 12 indicators with census tract data).

County	State	Percent HH Without a Vehicle	Percent Labor Force Unemployed	Percent Mobile Homes	Percent Pop Over Age 65	Percent Pop without Health Insurance	Percent Population Without HS Diploma	Percent Vacant Rentals	GINI Index	Median HH Income
Sierra	CA	5.46	5.30	9.00	26.40	9.40	7.09	0.17	0.48	44,190
Placer	CA	3.86	5.60	2.80	18.20	6.10	5.54	10.69	0.45	80,488
Trinity	CA	5.46	9.60	23.50	25.50	14.10	10.23	1.04	0.47	36,563
Tehama	CA	7.00	10.10	21.00	18.50	8.80	15.96	12.26	0.45	42,512
El Dorado	CA	4.71	8.10	5.30	18.90	6.00	7.10	4.26	0.46	74,885
Nevada	CA	4.21	7.30	5.90	24.40	9.70	6.45	3.28	0.46	60,610
Shasta	CA	6.87	6.80	11.30	19.40	9.40	9.32	10.90	0.46	47,258
Amador	CA	4.14	9.30	6.80	25.60	5.60	10.29	9.03	0.44	60,636

The bar at the bottom of the screen shows how many counties or census tracts (labeled as features) are included in the dataset on the screen.

- Sort by state or county to make it easier to look at specific areas within the map. NOTE: The list of counties within a state is not in alphabetical order.
- Click on the Options tab to export the data to a csv file, which can be easily saved as an Excel file. The options table also allows you to filter the data by specific properties (by state or county, for example) and show or hide specific columns.
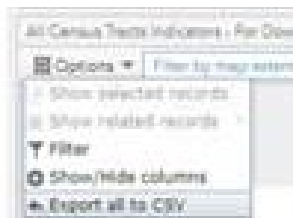
- Select one or more counties or census tracts of interest by clicking on the grey "Selection Handle" box to the left of the row.
- Use CTRL-click to select additional counties or census tracts.

At the Top Left: RAPT Tools

Query Tool
The Query Tool includes two different queries:

- The first allows you to zoom in and see all the census tracts in a specific county or state.
- The second provides specific information on the hospitals in a county or state, such as the trauma level.

Each tool provides a list of all desired entities with their census tract or hospital information and allows you to export the information to an Excel file, see averages/statistics across the selected entities, and view the results in the Attribute Table.

- Click on the Query icon and choose whether you want to select census tracts or hospitals.
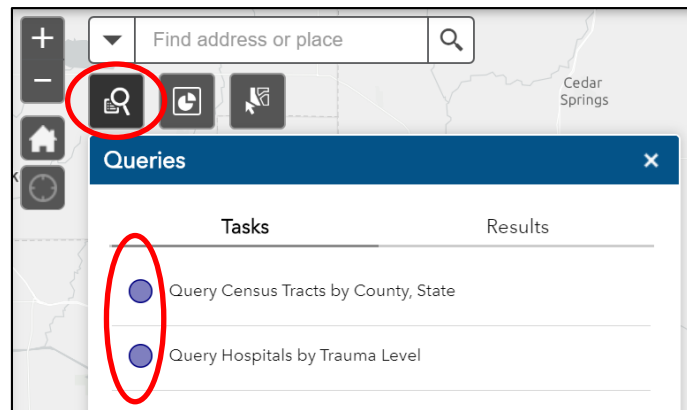
- If you select "Query Census Tracts" (left image below), select the state and county from the drop-down boxes and click the Apply bar at the bottom. If you select "Query Hospitals" (right image below), select the state, county, and trauma level from the drop-down boxes and click Apply.

- The map will zoom to that area and the list of selected features appears in the tool pop-up.


- To export, save or view this information in the Attribute Table, click the three dots at the top of the sidebar and select the desired action.
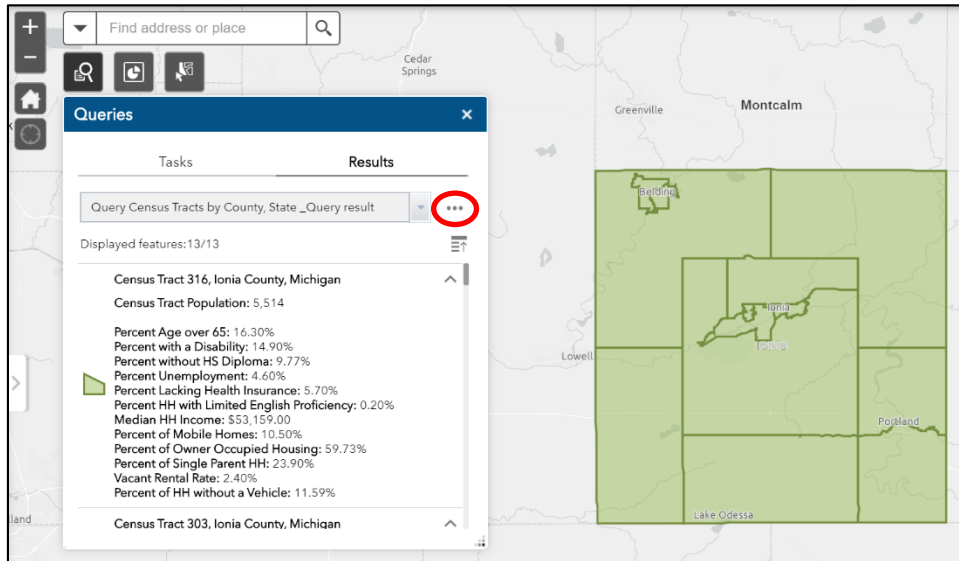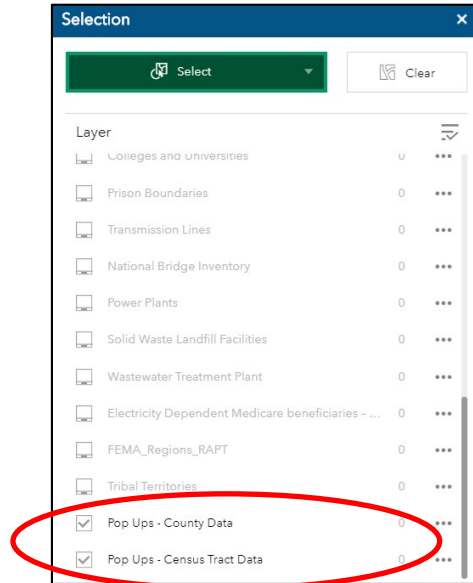

Selection

The Selection tool allows you to select multiple infrastructure, hazard, county, or census tract datasets in a specified region (rectangle, polygon, circle etc.). The output provides a number, visual, and comprehensive list of those multiple datasets. You may export, save, or view these datasets in the Attribute Table.

- Before using the Selection tool, turn on the infrastructure and hazard layers to be included in the output.

  – NOTE: Refer to the Infrastructure and Hazards sections on how to toggle on/off these layers.

- Click the Selection icon and the tool pop-up box appears. Select the infrastructure layers you wish to analyze by clicking on the boxes next to their names.

  – NOTE: Only the infrastructure layers you have turned before opening the tool can be selected and summarized. All other layers will be greyed-out as shown below and will not be included in the summary of entities.
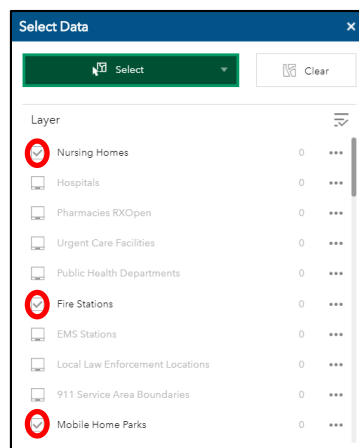
– NOTE**:** If you do not want to look at the counties or census tracts, and instead want to focus on infrastructure or hazard layers, turn off the "Pop-Ups – County Data" and "Pop-Ups – Census Tract Data" layers listed at the bottom of the layer list. Sometimes it is easier to see individual infrastructure entities with the county or census tract layers turned off.


- Click the arrow in the green "Select" box and select your desired shape from the drop-down list.

    – NOTE**:** When you place your mouse over the map after selecting the shape, a box will appear with instructions on how to draw the shape.
    – The Legend includes information about which infrastructure layers are turned on; the legend for this example is below.
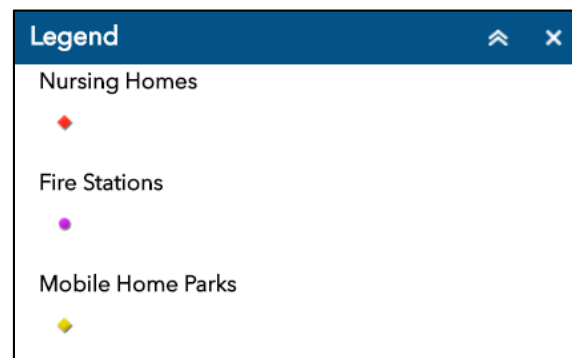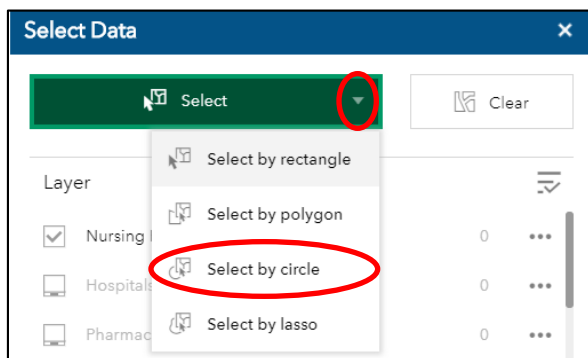
- After drawing the shape, you will see the infrastructure, hazard, county, and census tract entities selected within the shape.
- The image on the left shows the results of a circular drawing when census tracts are on. The image on the right shows the same drawing results when census tracts are off. The blue circles identify the various infrastructure entities within the selected area.
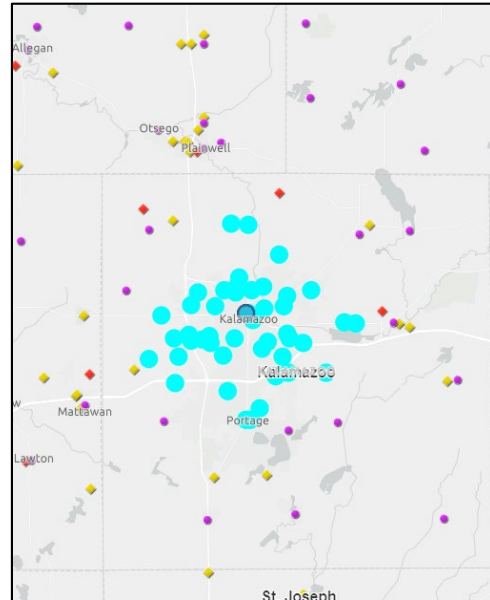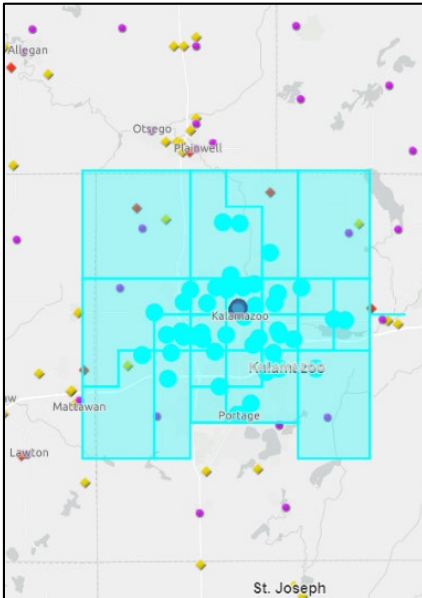

- The layer list displays the number of infrastructure entities and the number of counties and census tracts in the selected area.

  - In the example below, the area has seven nursing homes, 21 fire stations, and 17 mobile home parks.
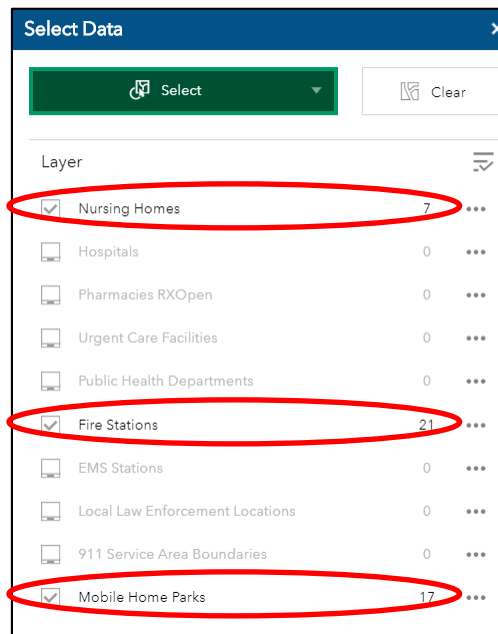
- Click on a specific layer to see a list of those entities within the area.

  – The example below shows the seven nursing homes in the area selected above.

- Click on one of the nursing homes in the list to display a pop-up on the map with that nursing home's information.
- To go back to the layer list and view other infrastructure entities, click on the arrow in the top left of the tool.
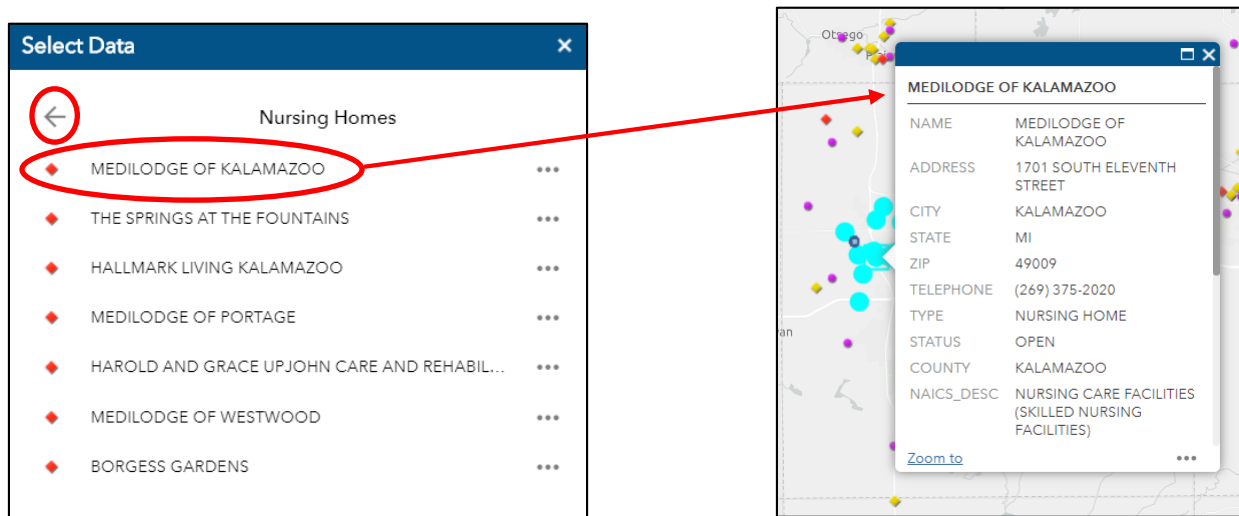
- To export, save, or view this information in the Attribute Table, click the three dots to the right of the specific layer you want to export and select the desired action.
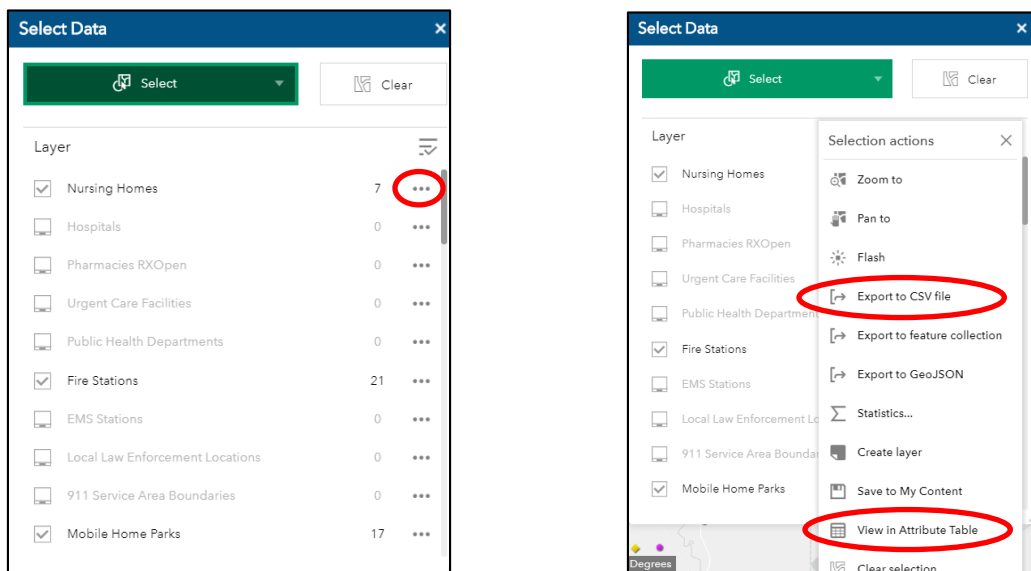

- To clear the results and select different entities or a different area, click the "Clear" button at the top of the Select Data tool.
- NOTE: If you wish to use the Population Count tool to calculate the total population within the selected census tracts as described below, do not click the "Clear" button.

Population Count

The Population Count tool calculates the total population of the census tracts that are selected by the Selection tool.

- NOTE: For this tool to work, you must have turned on the "All Census Tracts" layer when using the Select Data tool. If this layer was turned off, you will need to clear your results in the Select Data tool, turn on the "All Census Tracts" layer, and re-select the census tracts.
- After selecting several census tracts with the Selection tool, click the Population Count icon.
- The total population of the selected census tracts appears.
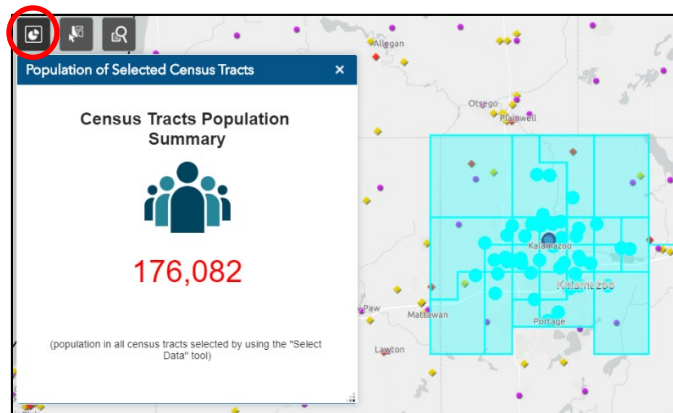
ANY QUESTIONS?

If you have questions or would like additional support in using the Resilience Analysis and Planning Tool, please email FEMA-TARequest@fema.dhs.gov. Please send us examples of how you are using RAPT, as well as recommendations for future improvements.