

PORTS GIS Viewer Application

The PORTS GIS Viewer Application is a web-based geographic information system (GIS) for viewing and querying geographic features at the U.S. Department of Energy Portsmouth (PORTS) Site in Piketon, Ohio. Features range from environmental data to buildings, roads, and other site facilities. Take a moment to review the application features and tools shown in figure 1 below, as well as the basic GIS terms listed in the glossary at the end of this document.

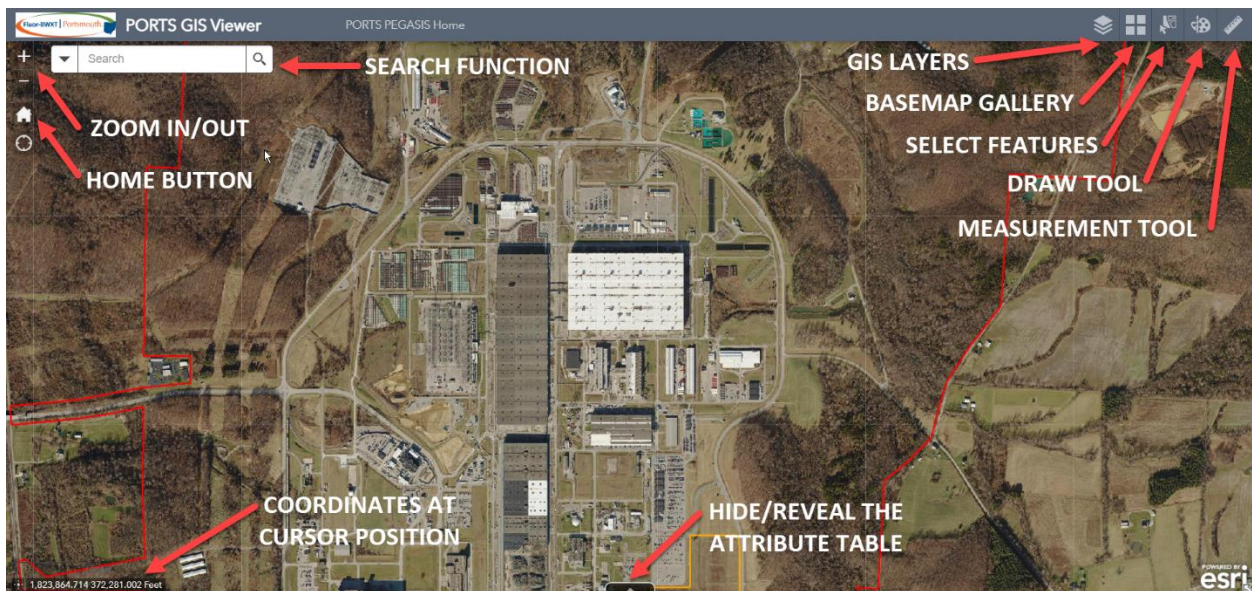




Figure 1 In this figure, the 'PORTS GIS Layers' window has been closed but will be open by default after selecting the application from the PORTS PEGASIS home page.

The PORTS PEGASIS home page can be reached anytime by clicking the 'PORTS PEGASIS Home' link at the top of your screen. Several tools are located at the top-right of the screen. The 'GIS Layers' window contains all of the datasets you can view and analyze. The 'Basemap Gallery' allows you to change the map background image by cycling through multiple years of aerial imagery. The 'Select Features' tool allows you to select map features for further analysis. The 'Draw' tool allows you to place points, lines, and other shapes on the map, as well as text (annotations). The 'Measurement' tool allows you to draw a line or polygon shape and measure the distance along that line or the area within the polygon.

The +/- buttons in the upper-left by the search function allow you to zoom in/out of the map. Click and hold the left mouse button to enable a panning gesture in the map. Rolling the mouse wheel zooms in/out in a similar way to the +/- buttons. The Home icon  beneath the +/- buttons restores the map to the default view. Beneath the Home icon, the 'Previous extent' and 'Next extent' arrows return the map view to your last map extent or to your current extent. A map scale is displayed on the lower-left of the screen (the length of the scale bar represents the distance listed beside it). Finally, your location on the map is shown in state plane coordinates as you navigate the map (the coordinates show your mouse cursor position). Note the small button next to the coordinates . Clicking this button allows you to change the behavior of the

display to show coordinates as you navigate the map, or, show coordinates at a specific location by clicking on the map.

1.) Search function

The 'Search' function allows you to type in a name for locations you are looking for. The dropdown button on the left of the search function window narrows the search to buildings and trailers, other structures, sampling locations, active wells, or roads. Due to the amount of data, it is recommended that you utilize the dropdown to narrow the search and speed-up the application. By default, the dropdown is set to 'All' and the application searches all available data.

Exercise #1: Searching by name

Let's assume you are searching for a building. In the 'Search' dropdown select 'Buildings or Trailers'. Type in 'X-710' and hit enter. The map view zooms to the first building in the provided list of X-710 related names. The building is also highlighted and a description window opens. You can also type in 'X-7' to return a list of all buildings and trailers whose names start with X-7, though the returned list may be larger than using X-710. Use the maximum number of characters you know to narrow the results. Use less characters for a broader range of results. Select any other name from the list and the map view and information pop-up updates (see figure 2 below).

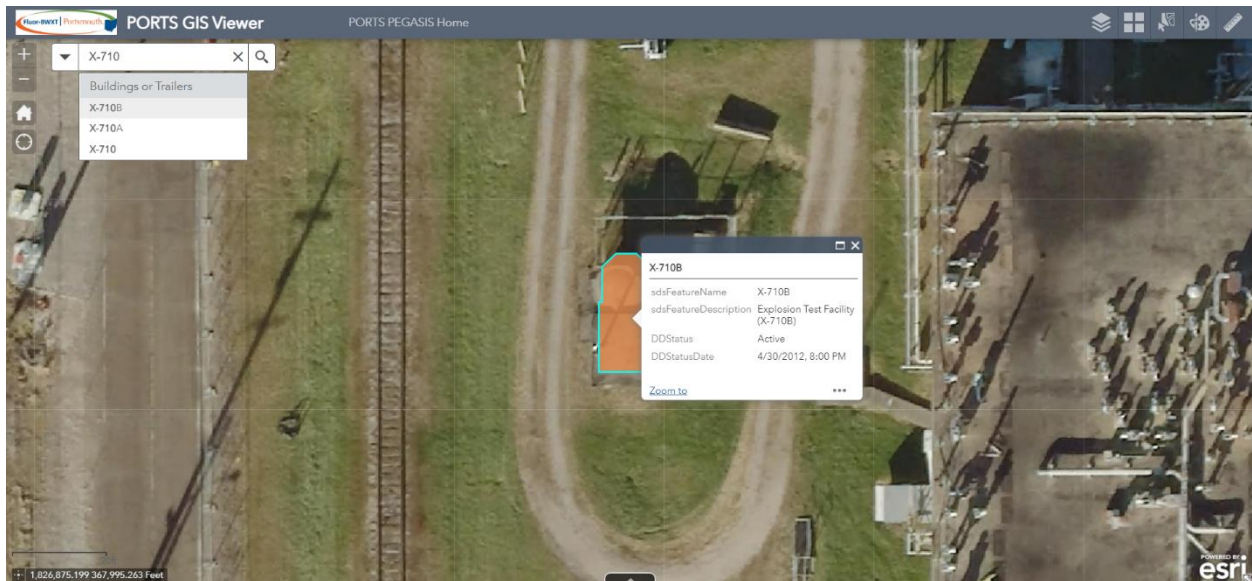






Figure 2 Results are displayed in the search window. Clicking on a result will zoom the map to the location selected and launch a pop-up window.

2.) GIS Layers window



Collections of geographic data are called layers when viewed in a GIS. The 'PORTS GIS Layers' window lists all of the geographic datasets displayed in the map. Some of the layers are grouped due to their similar qualities (such as the 'Facilities' group which includes buildings and fences). All of the groups listed in the 'GIS Layers' window are grouped into a top-level called 'Map Layers'. By default, the 'Map Layers' group is checked and the groups/layers will display (draw) on the map when the check box next to each individual layer is checked (checking the top-level check box only enables the display of the layers in the map, it does not actually turn on/off the layers).

Clicking the ellipsis icon  next to the top-level 'Map Layers' reveals a dropdown menu which allows you to zoom to the maximum map extent of all of the layers in the map, or adjust the transparency of all of the layers in the map. Clicking on the 'Transparency' option reveals a slider which makes the layers more or less transparent, allowing you to see features on the map background image underneath. This can be very useful for investigating why certain features are located where they are, or why the distribution of features changes over certain areas of the map.

Additional options are located within the visibility dropdown menu . Clicking on the menu reveals options for turning on/off all of the layers or collapsing/expanding all of the layers. The 'GIS Layers' window itself can be collapsed by clicking on the arrows icon , and closed entirely by clicking on the 'x' icon in the top-right of the window.

Clicking on the ellipsis icon  next to an individual layer reveals a secondary menu, which allows you to enable/disable the pop-up information window for that layer. The pop-up window displays some limited attribute information about the feature when it is zoomed to or clicked on in the map. The 'Open Attribute Table' option beneath the pop-up option opens the attribute table (spreadsheet display) for that layer in the map (see figure 3 on the next page).

Exercise #2: Using the attribute table

In the 'Map Layers' window, click the small arrow  next to the top-level 'Map Layers' to expand the layers and their respective groups. Next, click the arrow next to the layer group 'OREIS Station Locations' to expand the group and reveal the two layers 'OREIS Station Locations' and 'OREIS Active Wells'. Finally, click the arrow next to the layer 'OREIS Station Location' to reveal its feature symbology. The symbols you see listed under the layer name appear in the map. Click the ellipsis icon  next to the 'OREIS Station Locations' layer and select 'Open Attribute Table' from the menu (figure 3).

In the attribute table, click on the rectangle-shaped button at the far-left of the second row of the active tab (the first row lists field names for the data; the second row is the beginning of the data itself). After selecting (highlighting) a row of data, the location of the data is also highlighted in the map (figure 3). To get a closer look at this location, click the ‘Zoom to’ button at the top of the table, or double-click the same button used to make the row selection. The map zooms to the selected location (the double-click method will pop-out an information window at the location point with some limited options). Clear the selection in the table by clicking the ‘Clear Selection’ button.

By default, the ‘Filter by Map Extent’ option is turned on for all layers. For the purposes of this exercise, turn the ‘Filter by Map Extent’ option off by clicking the [Filter by Map Extent](#) button at the top of the attribute table.

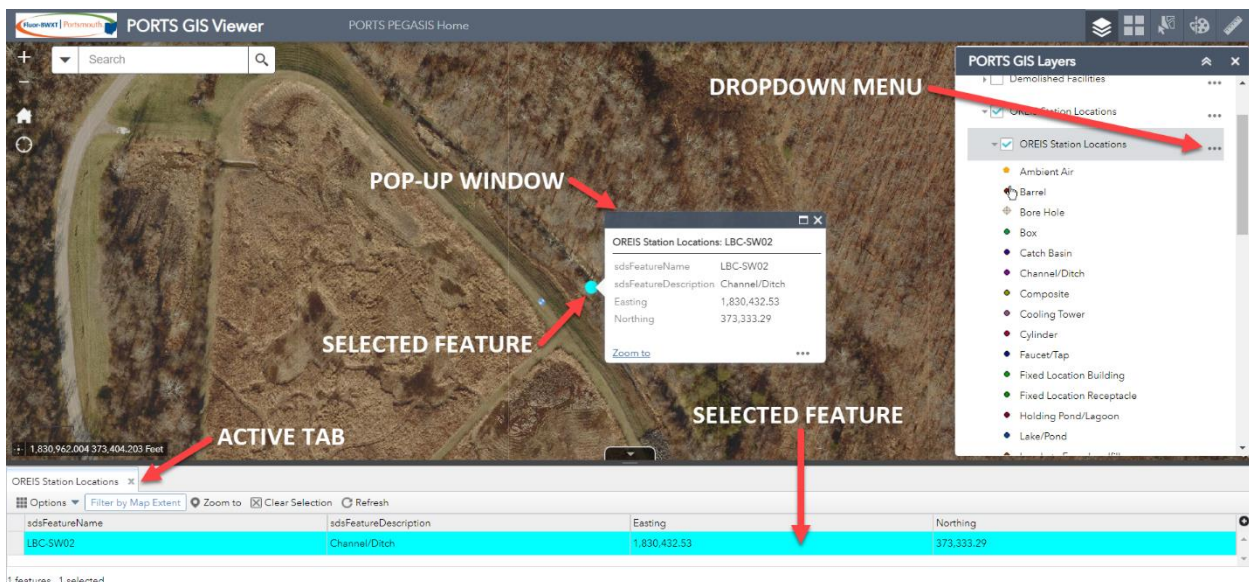


Figure 3 The individual features in a layer have a map location and a record in the attribute table. Information about features is displayed in the table and in the pop-up window.

Suppose you see a group of feature locations on the map and want to investigate only those locations. Zoom around the map until you find a cluster of station locations such as wells . Place the mouse cursor over the group of locations and roll the mouse wheel forward to zoom in until the map extent of the locations fills the screen. Next, click the ‘Filter by Map Extent’ button [Filter by Map Extent](#) at the top of the ‘OREIS Station Locations’ tab of the attribute table. Notice that the number of features listed at the bottom-left of the table is now shown as a much smaller subset of the original number of features in the layer (the only features listed in the attribute table are those that are shown on the map). The ‘Filter by Map Extent’ button is still active, so you can zoom in or out with the mouse and the data will change accordingly. Click the ‘Filter by Map Extent’ button again to deactivate it, then click the ‘Refresh’ button. You can also filter the features in a layer by selecting rows in the attribute table or by using the filter dialog window. Both options are discussed in section 3.

3.) Options dropdown list

The 'Options' dropdown list on the attribute table contains additional tools for filtering the data. The first two options are not active unless you have already made selections in the attribute table. Multiple features can be selected in the table by holding down the 'Shift' key on the keyboard and using the left mouse button to select records by clicking on the rectangle-shaped buttons at the far-left of the rows (see figure 4). After making a selection, you can click 'Show Selected Records' to display *only* those results in the table (click 'Show All Records' to restore the view). The third choice, 'Filter', uses more advanced selection methods than previous exercises, but allows greater control over the query. Finally, click on 'Show/Hide Columns' to customize the display of the attribute table by adding/removing data fields you are not currently interested in.

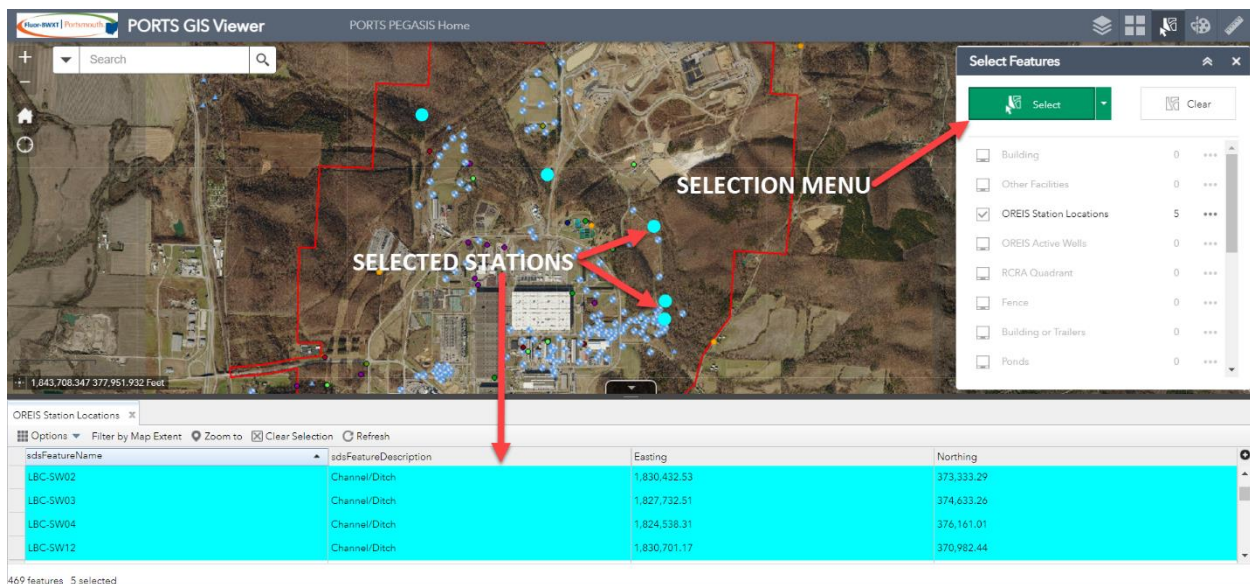



Figure 4 Selected features in a layer are highlighted in the map and in the attribute table. The selection menu provides an interface for choosing how you select features.

Exercise #3: Creating a filter data query

Click the 'Options' dropdown on the attribute table and select 'Filter'. A filter query window pops-up as seen in figure 5 below. The 'Filter' query tool allows you to refine data layers and isolate the locations of the data you are interested in. First, select 'Add a filter expression'. We will search for OREIS station name locations that start with X74. Select 'sdsFeatureName (String)' from the first dropdown. Select 'starts with' from the second dropdown. Then, type 'X74' in the last field above the 'Value' button (value is checked by default; you can use the 'Field' button to compare values in two different fields, or use the 'Unique' button to specify a certain value in the selected field). Your filter window should look like figure 5 on the next page.

Click 'OK' to execute the query. At this point, only the features whose names start with X74 are displayed on the map and in the attribute table. The locations whose names do not start with

X74 are not displayed on the map and are filtered out of the attribute table. To restore the display of all of the features in the layer, open the filter window and click the small icon  next to the text field to the right of the dropdown fields.

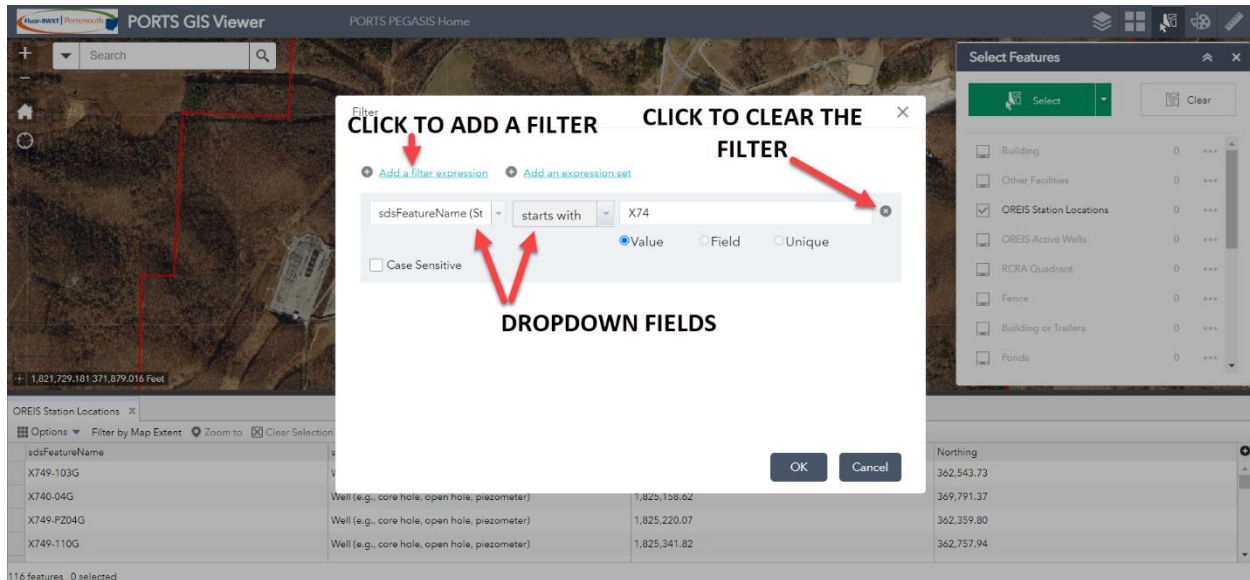






Figure 5 The ‘Filter’ window provides advanced selection methods used to view subsets of data.

4.) Select Features window

The ‘Select Features’ window provides a set of tools for interactively selecting features in a layer. All of the layers in the map are listed in the window below the ‘Select’ dropdown menu . To enable the selection of features in a layer, you must first check the check box next to the layer name. Multiple layers may be checked at once, thereby enabling selections in multiple layers. After making selections from the layers, you can clear the selections by clicking the ‘Clear’ icon  Clear in the top-right of the ‘Select Features’ window.

Exercise #4: Selecting features interactively

Open the ‘Select Features’ window by clicking on the ‘Select Features’ tool  in the upper-right of the screen. Check the check boxes next to the layer names for ‘Building’, ‘Other Facilities’ and ‘Fence’. Uncheck any other check boxes which may be checked. Click the dropdown arrow on the ‘Select’ menu  and choose ‘Select by Rectangle’. This tool allows you to draw a square on the map. All features from checked layers within that square will be selected. Zoom to an area where some demolished facilities and fences are in close proximity to each other and draw a square around them (follow the directions in the pop-up window next to your mouse cursor after selecting the tool). Note that multiple features are highlighted in the map from multiple layers. This is due to the fact that multiple layers are checked in the ‘Select Features’ window. Typically, there is only one layer of interest at a time, so uncheck the box for ‘Fence’, then click

the 'Clear' icon. Draw another square in the same area and notice that only features from the 'Demolished Facilities' layer are selected.

The additional tools in the 'Select' dropdown menu allow you to select features in different ways. All of the tools require that layers be checked to enable selections. The 'Select By Polygon' tool allows you to draw an area with irregular sides. The 'Select By Circle' allows you to draw a circle to quickly capture a broad area. Finally, the 'Select By Line' tool allows you to draw a line across the map. Any features from checked layers which intersect that line will be selected.

Once selections have been made in the map, they can be viewed in the attribute table and the tools discussed in other parts of this document may be applied to further restrict the search and narrow your results. After selecting features from a certain layer, click on the name of that layer in the 'Select Features' window to view an interactive display of those features (the ellipsis icon ... next to a selected *feature* provides additional options.

Clicking the ellipsis icon ... next to a *layer* name reveals an additional dropdown menu. The 'Zoom to' and 'Pan to' tools will zoom the map to the selected features. You can also select 'Flash' to flicker the selected features. The 'Statistics' tool reveals the mathematical properties of your selected data such as sum and average. The 'Create Layer' option will create a brand new layer from your selected features. The 'Add a Marker' tool places a point marker on the map in the area of your selected features. 'View in Attribute Table' will reveal the attribute table (if it is hidden) and show your selected features as highlighted rows. Finally, the 'Clear Selection' option will unselect (or clear) the selected features in the layer.

Thank you for learning about the PORTS GIS Viewer application! We hope you find it useful and user-friendly.

GLOSSARY

Attribute – non-spatial information about a geographic feature in a GIS, usually stored in a table and linked to the feature by a unique identifier. For example, attributes of a river might include its name, length, and sediment load at a gauging station.

Attribute Table - a database or tabular file containing information about a set of geographic features, usually arranged so that each row represents a feature and each column represents one feature attribute.

Column - the vertical dimension of a table. Each column stores the values of one type of attribute for all the records, or rows, in the table.

Coordinates - a set of values represented by the letters x, y, and optionally z or m (measure), that define a position within a spatial reference. Coordinates are used to represent locations in space relative to other locations.

Coordinate System - a reference framework consisting of a set of points, lines, and/or surfaces, and a set of rules, used to define the positions of points in space in either two or three dimensions. The Cartesian coordinate system and the geographic coordinate system used on the earth's surface are common examples of coordinate systems.

Data - any collection of related facts arranged in a particular format; often, the basic elements of information that are produced, stored, or processed by a computer.

Feature - a representation of a real-world object on a map.

Field - a column in a table that stores the values for a single attribute.

Geographic Information System (GIS) - a computer system for capturing, storing, checking, and displaying data related to positions on Earth's surface. GIS can show many different kinds of data on one map, such as streets, buildings, and vegetation. This enables people to more easily see, analyze, and understand patterns and relationships.

Layer - the visual representation of a geographic dataset in any digital map environment. Conceptually, a layer is a slice or stratum of the geographic reality in a particular area, and is more or less equivalent to a legend item on a paper map. On a road map, for example, roads, national parks, political boundaries, and rivers might be considered different layers.

Map - a graphic representation of the spatial relationships of entities within an area.

Map Extent - the limit of the geographic area shown on a map, usually defined by a rectangle. In a dynamic map display, the map extent can be changed by zooming and panning.

Row - the horizontal dimension of a table composed of a set of columns containing one data item each.

State Plane Coordinate System - a group of planar coordinate systems based on the division of the United States into more than 130 zones to minimize distortion caused by map projections. Each zone has its own map projection and parameters and uses either the NAD27 or NAD83 horizontal datum. The Lambert conformal conic projection is used for states that extend mostly eastwest, while transverse Mercator is used for those that extend mostly northsouth. The oblique Mercator projection is used for the panhandle of Alaska.

Symbology - the set of conventions, rules, or encoding systems that define how geographic features are represented with symbols on a map. A characteristic of a map feature may influence the size, color, and shape of the symbol used.

Query - a request to select features or records from a database. A query is often written as a statement or logical expression.

Query Expression - a type of expression that evaluates to a Boolean (true or false) value, that is typically used to select those rows in a table in which the expression evaluates to true. Query expressions are generally part of a SQL statement.

Sources:

ESRI (<http://support.esri.com/en/other-resources/qis-dictionary/browse/>)

'GIS' definition from National Geographic

(<https://www.nationalgeographic.org/encyclopedia/geographic-information-system-gis/>)