# PORTS Monitoring Wells and Boring Logs Application

The PORTS Monitoring Wells and Boring Logs application is a map viewer which displays information about the wells and associated boring logs at the U.S. Department of Energy Portsmouth (PORTS) Site in Piketon, Ohio. The interface allows you to search for monitoring wells using a variety of text fields and map tools. 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.

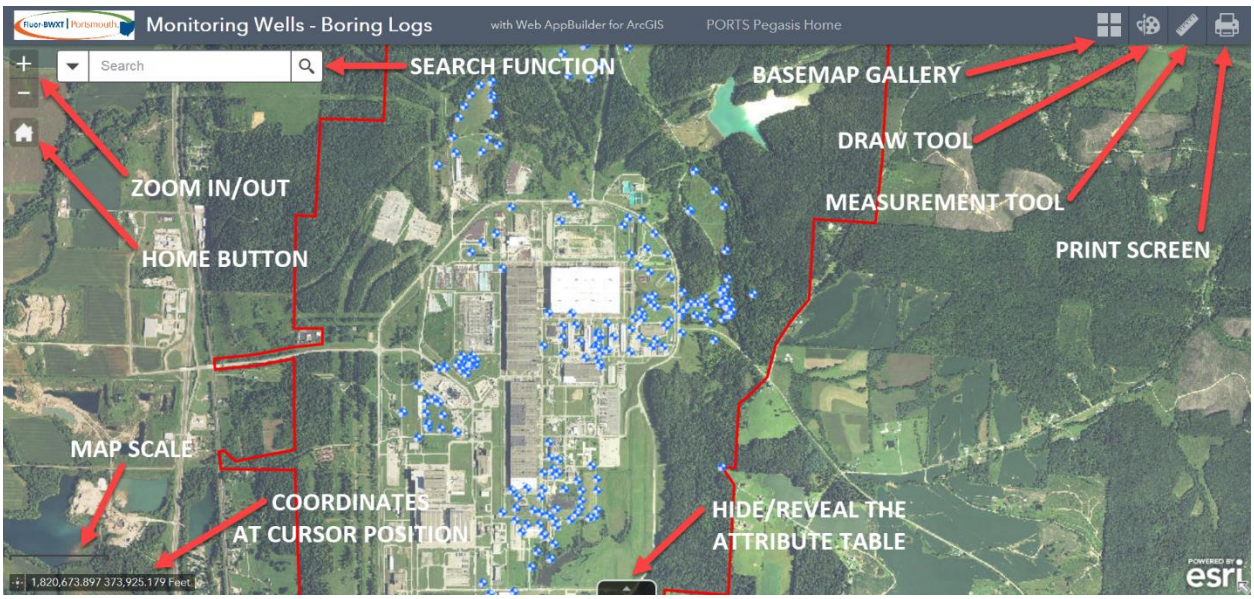


**Figure 1** *Well locations are shown as blue and white point symbols in the map.*

The PORTS PEGASIS home page can be reached anytime by clicking the 'PORTS PEGASIS Home' link at the top of your screen. To the right of the home page link are several tools. The 'Basemap Gallery' allows you to change the map background image by cycling through multiple years of aerial imagery. 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 'Print' tool allows you to export the current map view to a variety of common file formats (click on the 'Advanced' button within the print window for greater control over the export process).

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. 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 or active wells. 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 ‘Building 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).*

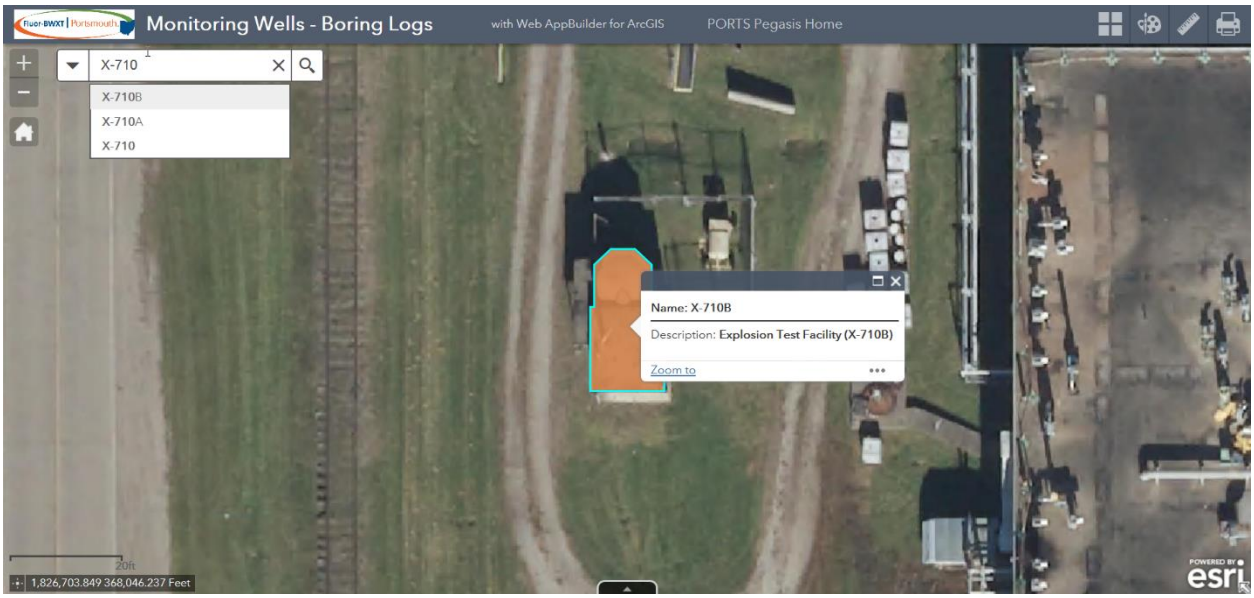


**Figure 2** *Results are displayed in the search window. Clicking on a result will zoom the map to the location selected and lauch a pop-up window.*

## 2.) Monitoring wells and boring logs

*Clicking on a well in the map pops-up an information windows which reveals various information about the well including its name, elevation, and install date. A link*

Click to View Boring Log *is provided to view the associated boring log which contains information about the geological formations (rock layers) the well lies within. At the bottom-right of the pop-up window, the ellipsis* ••• *dropdown menu allow you pan to selected features, add a marker, or view the well in the attribute table.*

***Exercise #2: Using the attribute table***

*Click on a well in the map and then click the ellipsis icon* ••• *at the bottom-right of the pop-up window. Select 'View in Attribute Table' from the dropdown menu. In the attribute table (spreadsheet) at the bottom of the screen, click on the rectangle-shaped button at the far-left of the second row (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 on the map (see figure 3 below). 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). Clear the selection in the table by clicking the 'Clear Selection' button.*

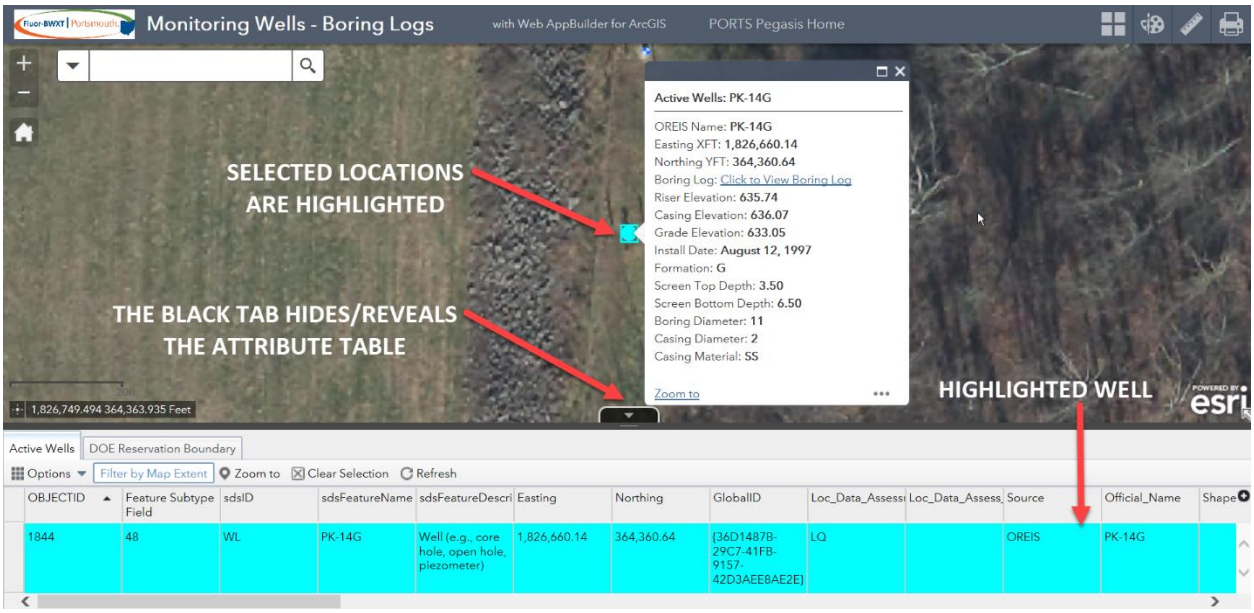


**Figure 3** *After clicking 'View in Attribute Table', a spreadsheet view of the data is displayed. Clicking on the black tab will hide or reveal the attribute table.*

*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.*

*Now, suppose you see a group of wells in the map and want to investigate only those locations. Place the mouse cursor over the group of wells and roll the mouse wheel forward to zoom in until the map extent of the wells fills the screen. Next, click the 'Filter by Map Extent' button.*

*Note the number of features listed at the bottom-left of the attribute table and the well locations shown in the map. Both are updated to show only the features in the current map view. Notice that 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. The table is now restored to its original content.*

**3.) Options dropdown list** 


The 'Options' dropdown list on the 'Active Wells' tab of the attribute table contains a list of tools for filtering the data. The first two options are not active unless you have already made selections in the data table. Multiple wells 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. 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.

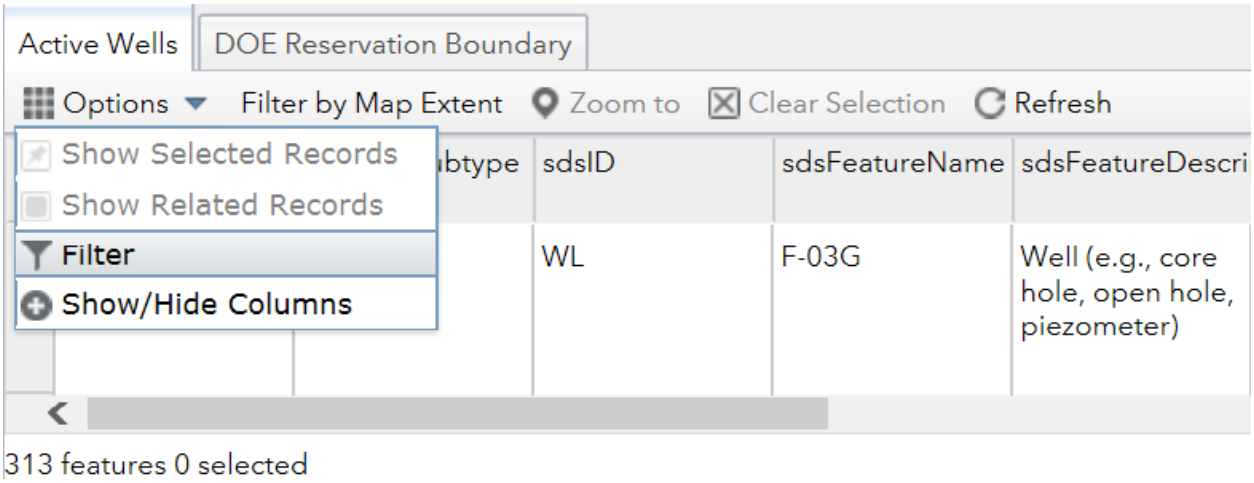


**Figure 4** *The 'Options' dropdown on the 'Active Wells' tab allows you to customize the attribute table display, or filter the samples by expressions or locations.*

***Exercise #3: Creating a filter data query***

*First, on the 'Active Wells' tab of the attribute table, click 'Clear Selection', then click 'Refresh'. Click the 'Options' dropdown and select 'Filter'. A filter query window pops-up as seen in figure 5 on the next page. The 'Filter' query tool allows you to refine the data further and isolate the locations of the data you are interested in. First, select 'Add a filter expression'. We will search for 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 below.*

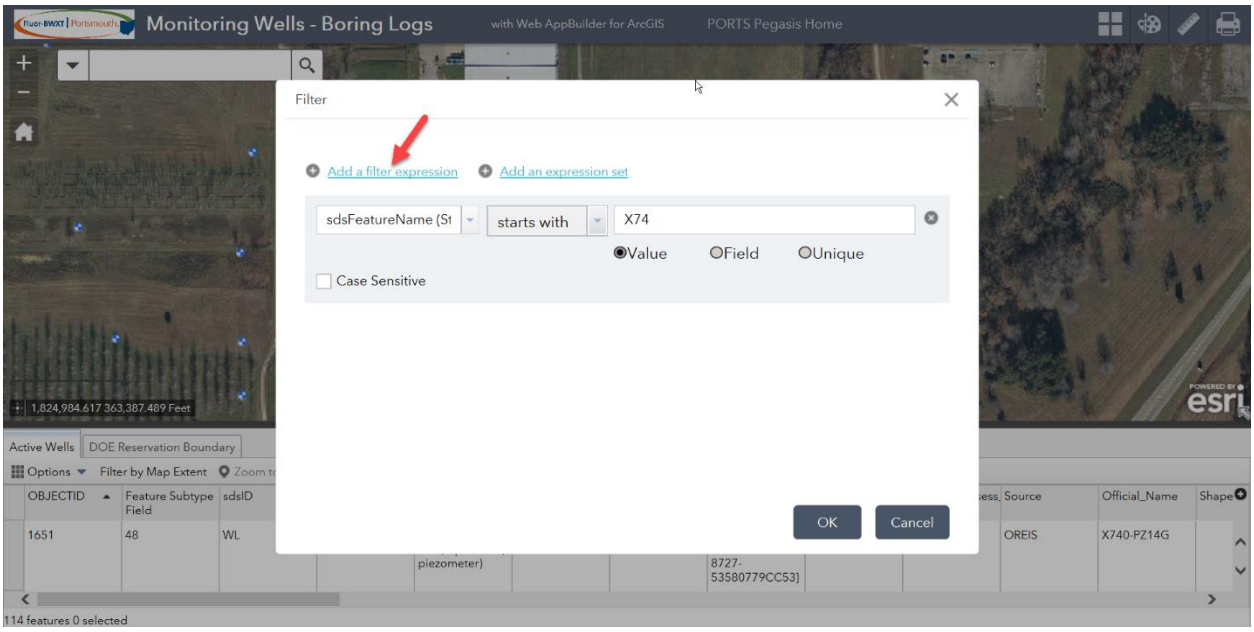


**Figure 5** *The 'Filter' window provides additional controls for refining search results.*

*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.*

Thank you for learning about the PORTS Monitoring Wells and Boring Logs 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.

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.

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/gis-dictionary/browse/)*

*'GIS' definition from National Geographic*
(https://www.nationalgeographic.org/encyclopedia/geographic-information-system-gis/)