PORTS Analytical Data and Plotting Application

The PORTS Analytical Data and Plotting Application is a search engine that returns results from environmental sampling conducted at the U.S. Department of Energy Portsmouth (PORTS) Site in Piketon, Ohio. The interface allows you to search for sample data using a variety of text fields and map tools. The sample locations are displayed as colored point symbols on the map. 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.

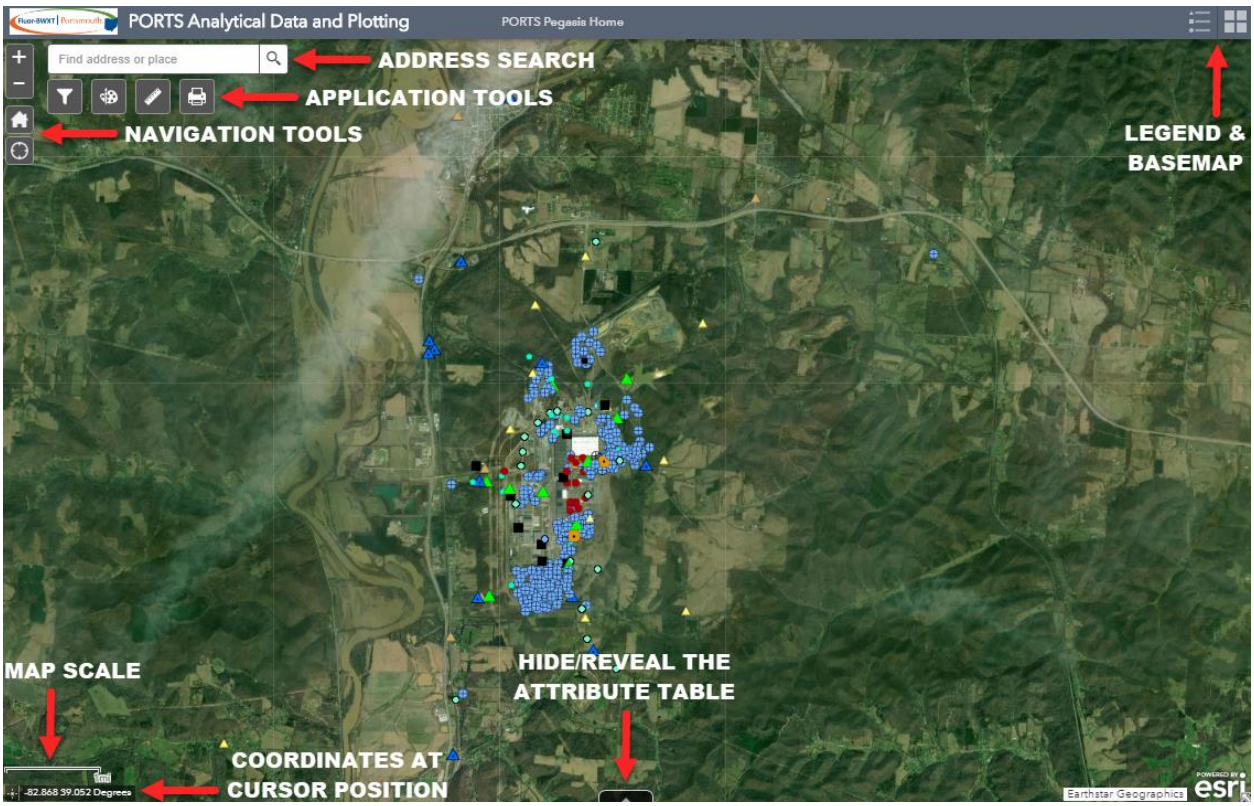

Figure 1 *In this figure, the 'Analytical Data Query' window has been closed but will be open by default after selecting the application from the PORTS PEGASIS home page.*

The PORTS PEGASIS home page can be reached anytime by clicking the 'PORTS PEGASIS Home' link at the top of your screen. To the right of the home page link, the **Legend** shows what the different map symbols represent, and the **Basemap Gallery** allows you to change the information displayed in the background image of the map viewer. To the left of the PEGASIS home link, a **Search Window** allows you to search for a location by address. 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 **Location** icon reveals your current location. Beneath the address search bar are the application tools .

The analytical data query widget will be discussed in detail below. The **Draw** tool allows you to place shapes and text on the map viewer. The **Measure** tool provides area/distance measurements in user-defined units by clicking points on the map and double-clicking to finish. The **Print** tool provides an interface for quickly exporting the map view to share your results with others. At the bottom of the map viewer, a **Scale Bar** is displayed on the lower-left of the screen (the length of the scale bar represents the distance listed beside it). Finally, the cursor location on the map is shown in decimal degrees as you navigate. Note the small button next to the coordinates . Clicking this button allows you to place a pin and show its position in decimal degrees. Click the button again to restore active coordinate tracking.

1.) Analytical data query window

The 'Analytical Data Query' window is a custom application widget which allows you to make data criteria selections, see a tabular (spreadsheet) display of that data, and view the corresponding sample locations on the map. The fields have dropdown menus from which selections can be made (see figure 2 below). The query window can be closed by clicking the 'X' button in the upper-right corner and opened by clicking the 'Analytical Data Query' icon.

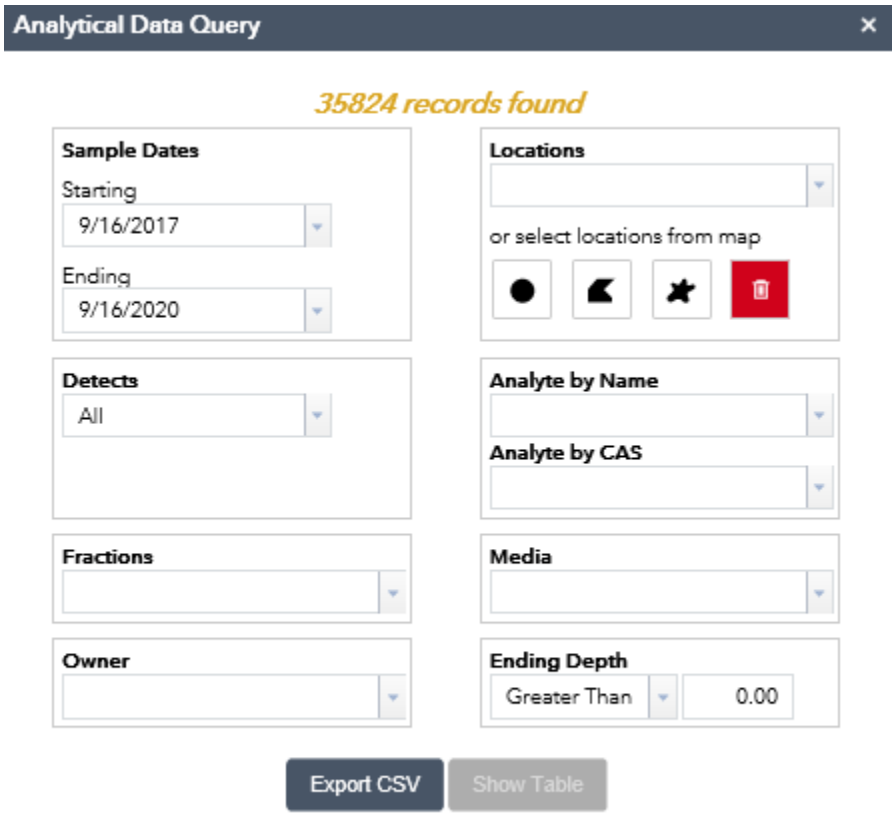

Figure 2 *The 'Analytical Data Query' window provides a series of dropdowns used to construct a query. The icon on the bottom-right allows you to resize the window.*

Exercise: Creating a data query

First, expand the query window by clicking and holding the left mouse button on the triangle of dots icon  *at the bottom-right of the window. Then, drag the window to the desired size (you can also move the window by holding down the left mouse button on the gray title bar at the top of the window).*

Next, select the date range which is specific to your inquiry. Using the pop-out calendar selector in the ***Sample Dates*** *field, select a start and end date to form the basis of your query. For the purposes of this exercise, we will assume you are interested in non-detects for iron in the groundwater over a period of several years. Leave the defaults in-place for the Sample Dates field. Next, the* ***Detects[1]*** *field provides three selections to include all results (detect and non-detect), or results which are above/below the detection threshold. Select Non Detects in this field. The* ***Fractions[2]*** *field restricts the query to a specific grouping of parameters, such as radionuclides. Since we are interested in iron, choose Metal in this field. The* ***Owner*** *field filters results based on the entity that collected the data. Select DOE in this field.*

In the second column of the window, the ***Locations*** *field and tools*  *allow you to restrict the results to a specific location using the dropdown, or by using the draw tools to interactively select a broader area. Regardless of the method used, selections made in the Locations field will result in an output of fewer results in a more limited area. Skip this field if your desire is to include all results based on the parameters specified in the other fields of the query window. Leave the Locations field blank. Next, specify the* ***Analyte[3]*** *of interest using the* ***Analyte by Name*** *and/or* ***Analyte by CAS[4]*** *dropdowns. Choose Iron in the Analyte by Name field. The* ***Media[5]*** *dropdown will restrict your query to a specific sample medium. Select Groundwater in this field. Finally, the* ***Ending Depth*** *field allows you to specify a threshold for soil samples which restricts the results to specific stratums. Since we are interested in iron in the groundwater, leave the defaults for this field.*

After selections have been made in the relevant fields specific to your investigation, there are two options to digest or disseminate the results. The Export CSV option will pop-out a field selector which allows you to export all the results based on your query, but only the specific attribute data fields (text data) relevant to the investigation. For example, the Project Name attribute is disabled by default. In a large query with many results over a long period of time, it may be important to turn this field on, thus providing a mechanism to sort the data by sampling event in the output .csv file. This could be especially useful for sharing a large body of results which will be investigated further based on the attribute data itself, rather than the locations and spatial patterns of that data. The second option, Show Table, allows you to open and examine a tabular (spreadsheet) view of the data within your web browser. While this method is not appropriate for sharing the data, it can be useful for examining how attributes vary across space and time.

[1] Detection refers to a result above the detection limit set per the data project or other collection criteria.

[2] Fraction refers to a grouping of measurement parameters that are typically analyzed together (such as RADS).

[3] Analyte refers to the chemical/element or other measurement parameter of the sample (e.g. silicon, pH, etc.)

[4] CAS number refers to a unique numerical identifier assigned by the Chemical Abstracts Service (CAS) to every chemical substance described in the open scientific literature. For non-chemical constituents, a site-specific identifier is assigned (e.g. pH = N704).

[5] Media refers to the medium the sample was collected from (e.g. air, soil, etc.).

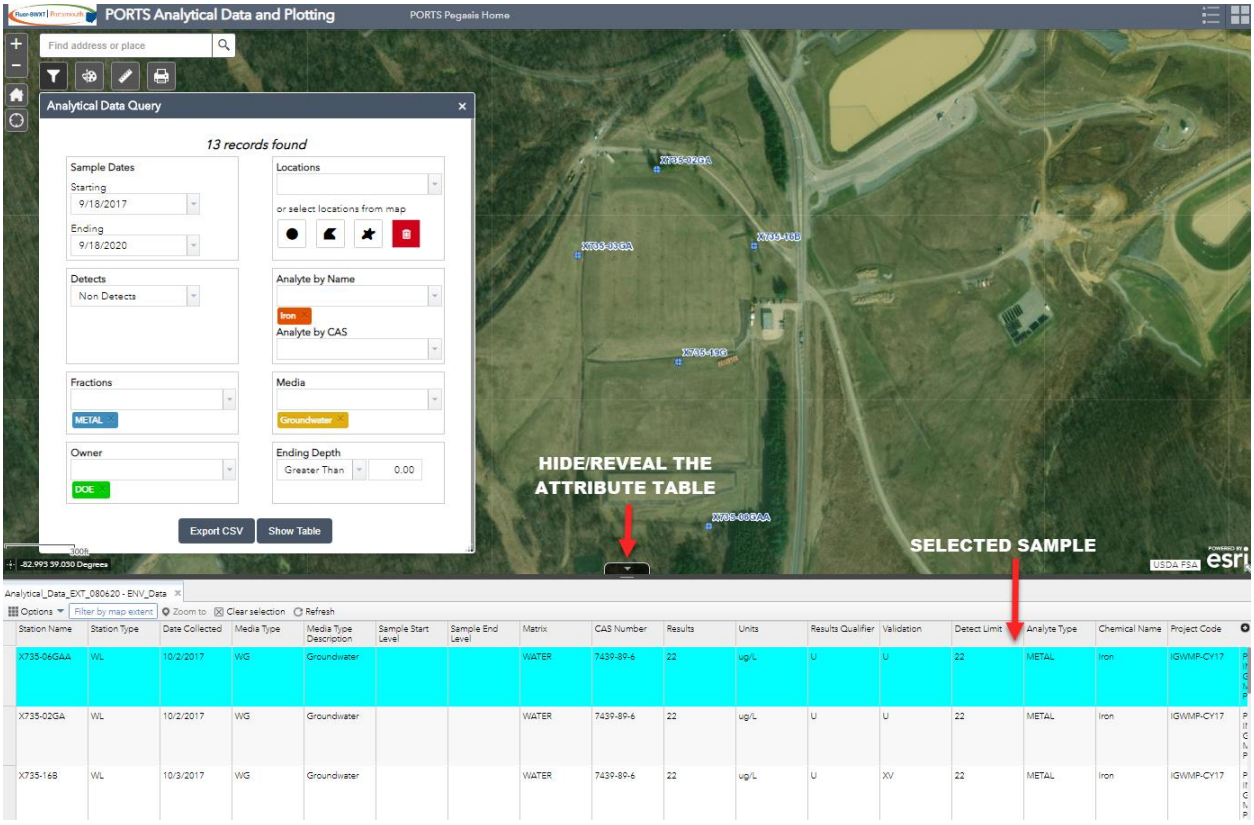

Figure 3 *After clicking 'Show Table', a spreadsheet view of the data is displayed. Clicking on the black tab will hide or reveal the attribute table.*

2.) Options dropdown list 

The 'Options' dropdown list on the 'Analytical Data' tab of the attribute table contains tools for filtering the data. The first two options are not active unless you have already made selections in the data table by clicking on the gray boxes to the left of the rows. Holding down the CTRL key allows you to select multiple rows. The 'Clear selection' button will unselect records. 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). Click on 'Show/Hide Columns' to customize the display of the attribute table by adding/removing data fields you are not currently interested in. The 'Export Selected to CSV' option will create a subset version of the query results based on the features highlighted in the attribute table.

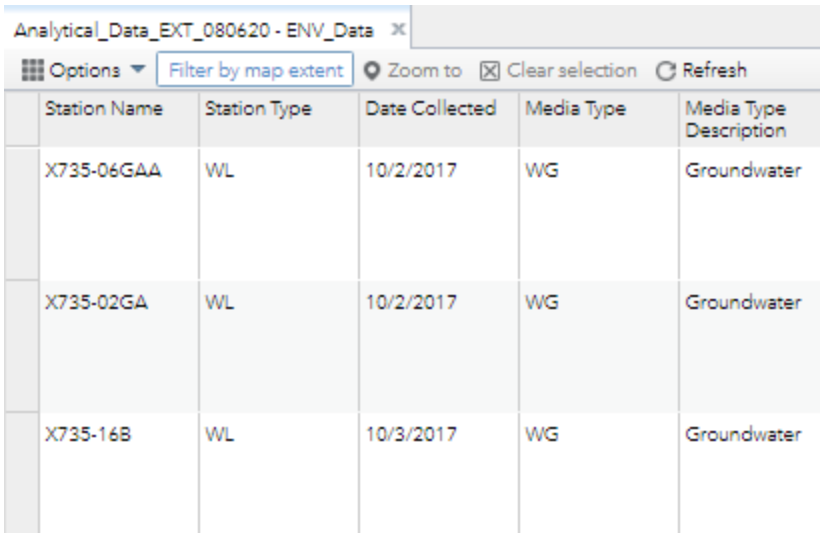

Figure 4 *The 'Options' dropdown on the 'Analytical Data' tab allows you to customize the attribute table display, or filter the table results.*

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. [1]

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/)

[1] The US Department of Energy Portsmouth site uses NAD83(2011) State Plane Ohio South FT as the coordinate system with a Lambert conformal conic projection.

Qualifier	Field	Description
=	Results Qualifier	Globally assigned validation qualifier where no other qualifier.
B	Results Qualifier	ANION/METAL/OTHIN/TCLPMET/WETCHEM: Value was less than the CRDL (Contract Required Detection Limit) or RRL (Required Reporting Limit) specified, but greater than or equal to the IDL (Instrument Detection Limit)/MDL (Method Detection Limit); DI FURA/HERB/PPCB/SVOA/TCLPHRB/TCLPVOA/TCLPSVL/TCLPPST/VOA/OTHOR: Compound was found in the associated blank as well as in the sample; DI FURA/HERB/PPCB/RADS/SVOA/VOA): Found in blank/sample (pre-05/30/03 definition)
S	Results Qualifier	METAL/TCLPMET: Determined by Method of Standard Additions; DI FURA: Signal-to-noise ratio of the confirmation ion does not meet 2.5 S/N requirement but peak was determined to be positive in the judgement of the GC/MS analyst
U	Results Qualifier	ALL ANALYSIS TYPES: Not detected
W	Results Qualifier	METAL: Post-digestion spike for AA(Atomic Absorption) out of control limit
X	Results Qualifier	METEO: Rate of change exceeded; DI FURA/HERB/PPCB/SVOA/TCLPHRB/TCLPVOA/TCLPSVL/TCLPPST/VOA: Used when more than five qualifiers are required for a result
*	Results Qualifier	ANION/METAL/RADS/OTHIN/TCLPMET: Duplicate analysis was not within control limits; DI FURA/HERB/PPCB/SVOA/TCLPHRB/TCLPVOA/TCLPSVL/TCLPPST/VOA: Surrogate values outside of control limits; ALL ANALYSIS TYPES: Duplicate analysis not within control limits (pre-05/30/03 definition)
+	Results Qualifier	METAL: Correlation coefficient for MSA (Method of Standard Additions) < 0.995
A	Results Qualifier	SVOA/VOA: TIC (Tentatively Identified Compound) was suspected aldol condensation product; PPCB/SVOA/VOA: Suspected aldol-condensation product (pre-05/30/03 definition)
C	Results Qualifier	METEO: Calm wind (wind speed only); PPCB: Pesticide confirmed by GC/MS(Gas Chromatography/Mass Spectrometry); METAL: Possible contamination
E	Results Qualifier	ANION/METAL/OTHIN/TCLPMET: Estimated, matrix interference; DI FURA/HERB/OTHOR/PPCB/SVOA/TCLPHRB/TCLPVOA/TCLPSVL/TCLPPST/VOA: Concentration exceeds calibration range of the instrument
J	Results Qualifier	BIOSURVY: Estimated value; ALL ANALYSIS TYPES: Estimated Quantitation; ANION/DI FURA/HERB/PHYSC/PPCB/RADS/SVOA/VOA: Estimated, TIC (Tentatively Identified Compound) or < specified detection limit (pre-05/30/03 definition)
M	Results Qualifier	METAL: Duplicate injection precision not met; RADS: Matrix Spike recovery is < 80% or > 120% (pre-05/30/03 definition)
L	Results Qualifier	METEO: Low alarm limit exceeded (data valid); RADS: Reported measurement is associated with a negative blank; RADS: Laboratory Control Sample activity exceeds plus/minus 3 standard deviations of the mean (pre-05/30/03 definition)

P	Results Qualifier	HERB/PPCB: > 25% difference between two columns for Pesticides/Aroclors; METEO: Power down during reporting interval; BIOPOP: Value reflects loss to predation
D	Results Qualifier	METEO: Channel disabled during interval; RADS: Sample is statistically different from duplicate; BIOPOP: Value reflects decrease due to sampling; DI FURA/HERB/PPCB/SVOA/TCLPHRB/TCLPVOA/TCLPSVL/TCLPPST/VOA/OTHOR: Identified in an analysis at a secondary dilution; ANION/DI FURA/METAL/PPCB/SVOA/VOA: Identified at secondary dilution (pre-05/30/03 definition)
N	Results Qualifier	ANION/METAL/OTHIN/TCLPMET/WETCHEM: Spike recovery not within control limits; SVOA/VOA: Applied to TIC (Tentatively Identified Compound) results that are reported as specific compounds based on a mass spectral library search; ALL ANALYSIS TYPES: Test was terminated prematurely (pre-05/30/03 definition); ANION/METAL: Spike recovery not within control limits (pre-05/30/03 definition); SVOA/VOA: Applied to TIC (Tentatively Identified Compound)results that are reported as specific compounds based on a mass spectral library search - does not apply to TICs reported as general classes of compounds (pre-05/30/03 definition)
?	Results Qualifier	Other, defined in COMMENTS column
F	Results Qualifier	BIOSURVY: RADS: For alpha spec., FWHM(Full Width at Half Max) exceeded acceptance limits
G	Results Qualifier	BIOTOX: Male
H	Results Qualifier	Analysis performed outside holding time requirement.; METEO: High alarm limit exceeded(data valid)
I	Results Qualifier	BIOTOX: Indeterminate sex; RADS: Tenatively identified isotope(Mixed Waste Characterization Project, Y-12 Oil Land Farm Soils definition)
K	Results Qualifier	RADS: Missing one or more lines in spectrum
O	Results Qualifier	METEO: Rate of change alarm limit exceeded (data valid)
V	Results Qualifier	Incomplete sample (e.g., sample is a partial filet); METEO: Variable wind direction
<	Results Qualifier	Numerical value reported was less than the requested reporting limit (e.g. MDL, MDA, RRL, IDL).
>	Results Qualifier	Actual value was greater than the reported result.
Y	Results Qualifier	Other, defined in COMMENTS column.
T	Results Qualifier	Trace amount
Q	Results Qualifier	One or more quality control criteria failed (e.g., LCS recovery, surrogate spike recovery, or CCV recovery).
J	Validation	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
U	Validation	The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
?	Validation	Other, defined in COMMENTS column (historical)
N	Validation	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification."
=	Validation	Validated result, which is detected and unqualified

UJ	Validation	Analyte, compound or nuclide not detected above the reported detection limit, and the reported detection limit is approximated due to quality deficiency.
NJ	Validation	Presumptively present at an estimated quantity (use with TICs only).
XV	Validation	Not validated; Refer to the RSLTQUAL field which may contain more information
XX	Validation	Unknown; Refer to the RSLTQUAL field which may contain more information
XZ	Validation	Data evaluation performed; Validation qualifiers not applied; Refer to the RSLTQUAL field which may contain more information