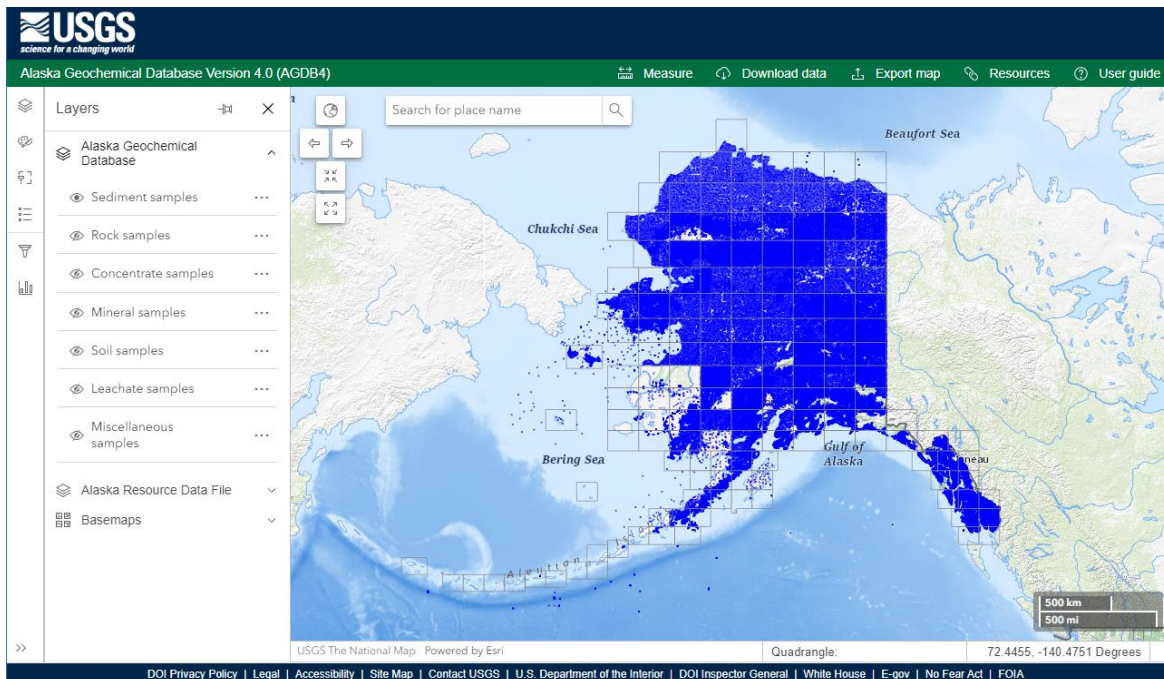


# Alaska Geochemical Database Portal

## A Data Visualization and Extraction Tool

### Introduction

This web map provides access to the data published with the Alaska Geochemical Database Version 4.0 (AGDB). The AGDB is a large and complex dataset that has traditionally been difficult to access without specialized software and detailed knowledge of the database structure. By providing the data through a web map we hope to make this information more accessible for a broad selection of users.



The AGDB contains geochemical data compilations in which each geologic material sample has one “best value” determination for each analyzed species. Best values are for mineral exploration and assessment purposes and should not be assumed to be appropriate for other uses. All analytical values presented in this web map are from the best value fields. Downloading the data through the web map, or from the publication home page <https://doi.org/10.5066/P14THGQH>, will provide access to fields with additional analytical results for a sample.

The analytical results were determined by 120 laboratories using a variety of analytical methods on 416,333 rock, sediment, soil, mineral, heavy-mineral concentrate, and oxalic acid leachate samples. These data represent analyses of samples collected by the U.S. Geological Survey (USGS), Atomic Energy Commission National Uranium Resource Evaluation (NURE), Alaska Division of Geological & Geophysical Surveys (DGGS), U.S. Bureau of Mines, and U.S. Bureau of Land Management from 1938 through 2021. Negative values for an element indicate results less than the detection limit of the analytical method. Limit may vary within method and over time.

## Terms and Conditions

Unless otherwise stated, all data, metadata and related materials are considered to satisfy the quality standards relative to the purpose for which the data were collected. Although these data and associated metadata have been reviewed for accuracy and completeness and approved for release by the U.S. Geological Survey (USGS), no warranty expressed or implied is made regarding the display or utility of the data on any other system or for general or scientific purposes, nor shall the act of distribution constitute any such warranty.

## Getting Started

### Downloading Data

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Data for the AGDB layers can be downloaded and saved to a local file through the download data panel. All the samples for a layer can be downloaded in a single file, or they can be prefiltered based on their location or attributes. See “Download data panel” under the “Header Buttons” section for more information.

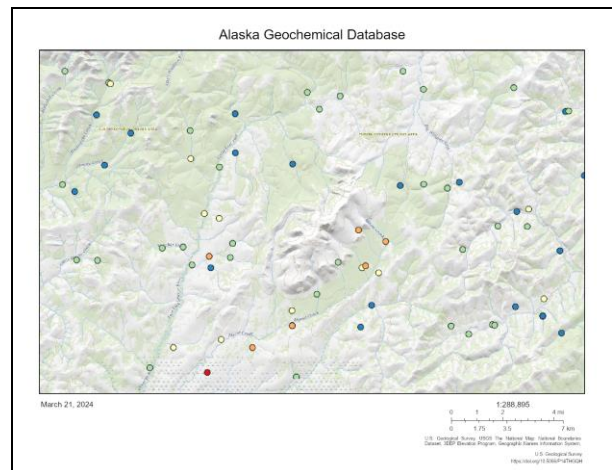
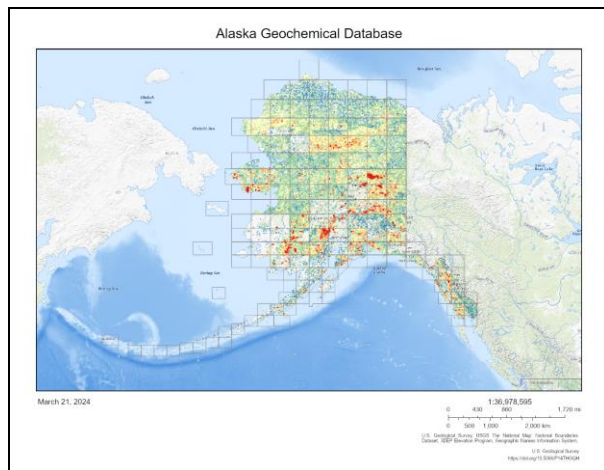
### Filtering Data

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Each of the seven AGDB layers can be independently filtered using the controls in the “Area of interest”, “Element groups”, and “Attribute filter” panels. These filters can be used together or separately as needed.

- Setting an area of interest is the highest level of filtering available. Samples are excluded based on their location only. See “Area of interest panel” under the “Panel Buttons” section for more information.
- Group filters provide a way to filter for the presence of multiple elements using predefined groups of elements such as critical minerals or precious metals. These filters only indicate that a sample has an analytical value for one or more elements in the group. See “Element groups panel” under the “Panel Buttons” section for more information.
- Attribute filters provide the lowest level of filtering available. Individual fields from the database can be selected and their values used to precisely control the points displayed. See “Attribute filter panel” under the “Panel Buttons” section for more information.

## Creating and Saving a Map



Maps can be created at a wide range of scales from statewide to local areas of interest. A map can be as simple as showing samples from a single AGDB layer using the default symbology, or as complex as multiple layers with different symbol shapes, classified colors, and one or more filters applied to the layers. Each of the seven AGDB layers can be independently displayed, symbolized, and filtered.

- Layers panel – Turn layers on or off, change their drawing order, or change their opacity.
- Symbology panel – Change the shape of a symbol, its color, or classify by best values for an element and color using a blue to red color ramp.
- Area of interest panel – Restrict points displayed using a user defined box or polygon.
- Element groups panel – Use a group filter to display points with values for one or more preset groups of elements.
- Attribute filter panel – Filter points by one or more database fields using specific attribute values.

Exporting a map to a pdf or other file type is accomplished through the export map panel. See “Export map panel” under the “Header Buttons” section for more information.

# Header Buttons



## Measure panel

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Measure distances or areas on the map.

### 1. Measurement tools

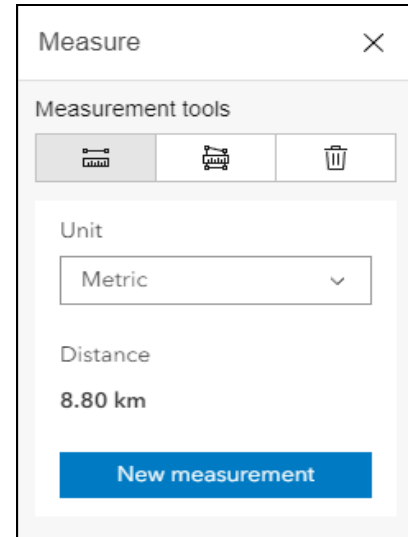
- Distance measurement – Activate straight line measure tool to draw line segments on the map.
- Area measurement – Activate area measure tool to draw a polygon on the map.
- Clear measurement – Remove any existing measurements.

### 2. Unit

Distances and areas can be reported using a variety of different units. Default is Metric.

### 3. New measurement

Take new measurement for active tool.



## Download data panel

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Download data for an AGDB layer and save to a local file. The samples available for download from each layer can be filtered using the area of interest, element groups, or attribute filters. A count next to the layer name will indicate how many samples will be downloaded based on any filters in place. Downloaded files will include all the fields and attributes from the published database. Coordinates will be in geographic WGS84.

### 1. Layer

Select AGDB layer for downloading.

### 2. File format

Files can be saved in these formats.

- CSV (comma separated value)
- GeoPackage
- File geodatabase

### 3. File links

When a download request is completed by the server a link to the file will be provided in this box. This link will remain valid for fifteen minutes. After that time the file will be automatically removed from the server.

The screenshot shows a 'Download data' dialog box. It has a title bar with a close button (X). The dialog is divided into sections: 'Layer' with a dropdown menu showing 'Sediment (163,111)'; 'File format' with a dropdown menu showing 'File geodatabase'; and 'File links (Valid 15 minutes)' which contains a large empty text box for the download link. At the bottom, there are two buttons: 'Download' (highlighted in blue) and 'Cancel'.

## Export map panel

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Export a copy of the current map view. File can be viewed in the web browser, depending on file format, or saved to a local file. Parameters that can be adjusted include the map title, layout size and orientation, export file type, and export file resolution. A scalebar and credit information will be automatically added to the file.

### 1. Map title

Set custom title for map.

### 2. Page setup

Select size and orientation of map layout.

- Letter ANSI A landscape, Letter ANSI A portrait
- Tabloid ANSI B landscape, Tabloid ANSI B portrait
- A3 landscape, A3 portrait
- A4 landscape, A4 portrait

### 3. File format

Maps can be exported to these formats.

- PDF, JPG, or PNG32

### 4. DPI

Maps can be exported at these resolutions.

- 96, 150, or 300 dpi

### 5. File links

When an export request is completed by the server a link to the file will be provided in this box. This link will remain valid for fifteen minutes. After that time the file will be automatically removed from the server.

The screenshot shows a web-based dialog box titled "Export map". It includes a close button (X) in the top right corner. The "Map title" section has a text input field with "Alaska Geochemical Database". The "Page setup" section has a dropdown menu set to "Letter ANSI A landscape". The "File format" section has a dropdown menu set to "PDF". The "DPI" section has a dropdown menu set to "96". Below these is a section for "File links (Valid 15 minutes)" with a large empty text area. A blue "Export" button is positioned at the bottom right of the dialog.

## Resources

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Menu of links to related publications that may be of interest including previous versions of the AGDB, an evaluation of geochemical methods for stream samples, the Alaska geochemical atlas, the Alaska Resource Data File, and the Geologic map of Alaska.

## Location Search

Place names for geographic features within Alaska can be located using the search box in the upper left of the map. As the name is entered a list of suggested matches will appear beneath the box. Selecting a feature name will zoom to the location and mark it with a symbol.



## Popups

Clicking on points from the AGDB or ARDF layers will open a popup window listing its attributes. By default, this window will be docked in the upper right corner of the map. For AGDB locations sample properties are listed first followed by the best values and associated analytical method for each element.

Sediment samples		
Zoom to		
AGENCY	NURE	
DATE_COLLECT	1978/08/11	
DATE_SUBMITTED	1978/09/01	
PROJECT_NAME	NURE	
QUAD	Iditarod	
SAMPLE_SOURCE	pond-natural	
SUBMITTER	National Uranium Resource Evaluation	
Aluminum (Al_pct)	1.01	NA_LC
Antimony (Sb_ppm)	-10	NA_LC
Arsenic (As_ppm)	78	EDX
Barium (Ba_ppm)	-416	NA_LC
Beryllium (Be_ppm)		
Bismuth (Bi_ppm)	-5	EDX
Boron (B_ppm)		
Bromine (Br_ppm)		
Cadmium (Cd_ppm)	9	EDX

## Navigation Buttons

A group of five buttons in the top left corner of the map view that can be used to change the map extent.

- Full extent – Return map to a full view of the entire state
- Previous extent – Go back to previous view of map
- Next extent – Return to view of map before previous extent
- Zoom in
- Zoom out



The mouse wheel can also be used to zoom in or out. Clicking and holding down the left mouse button will pan the map. Holding down the shift key and dragging a box will zoom the map to that extent.

## Panel Buttons

Group of six buttons along the left side of the map. The first four buttons can be used to display one of the panels that will open to the left of the map. These panels can be pinned open for viewing side by side with neighboring panels. The last two buttons will open panels below the map.

- Layers
- Symbology
- Area of interest
- Element groups
- Attribute filter
- Charts





## Layers panel

Controls which layers are visible on the map. It contains three group layers.

### 1. Alaska Geochemical Database

Seven separate point layers for each unique Primary Class identified in the AGDB. Each layer can be turned on or off separately. The order of the layers can also be changed by selecting and dragging an entry. This will change the drawing order of layers in the map. The Options button to the right of the layer name will display an additional menu below the layer for opening the attribute table or changing the opacity of the layer. The attribute table will be displayed as a new closeable tab in the panel below the map.

- Sediment samples
- Rock samples
- Concentrate samples
- Mineral samples
- Soil samples
- Leachate samples
- Miscellaneous samples

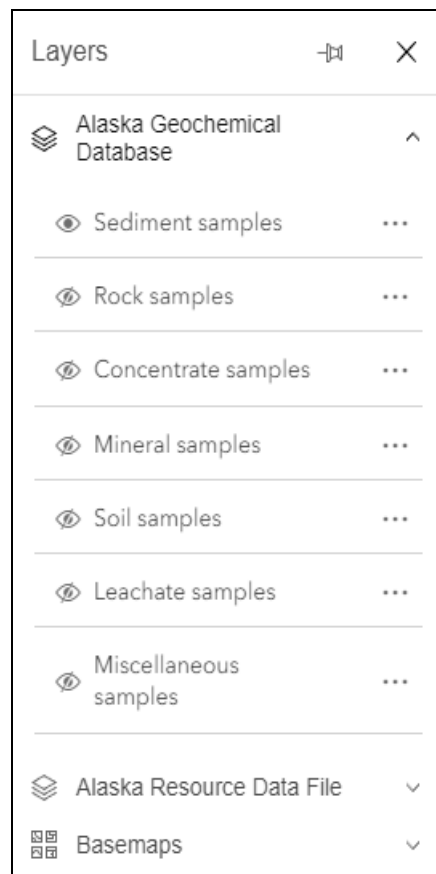
### 2. Alaska Resource Data File

The Alaska Resource Data File provides descriptions of mines, prospects, and occurrences across the state. The records in the database are generally for metallic mineral commodities only, but also may include certain high value industrial minerals such as barite and rare earth elements. Common industrial minerals such as sand and gravel, crushed stone, and limestone and energy minerals such as peat, coal, oil, and gas are not included in this database. The descriptions in the database were compiled using published literature, unpublished reports and data from various sources including the U.S. Bureau of Mines, the U.S. Geological Survey, and industry.

- ARDF locations – Unique symbols for each location type of mine, prospect, or occurrence

### 3. Basemaps

- USGS The National Map (default) – Most current topographic base for Alaska
- Satellite – Low to high resolution satellite imagery
- USA Topo Maps – Legacy 250k and 63k Alaska topographic maps

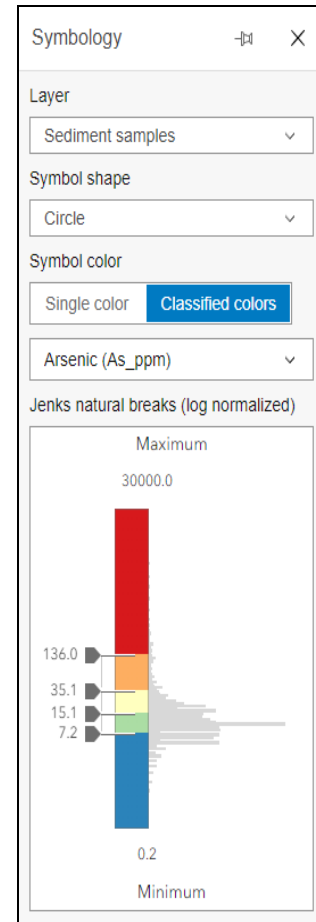
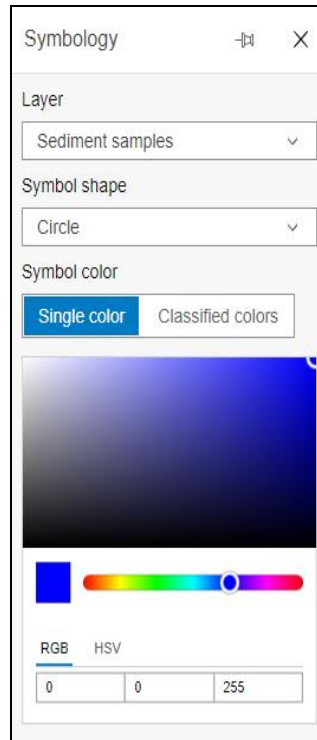


- USGS Geologic Map of Alaska (Wilson and others, 2015) – Most current statewide geology. Switching to this base will also add an additional “Geologic Unit” window to the map. When the cursor hovers over the geology this window will display the unit label, unit name, and age for the geology at that location

## Symbology panel

By default, the AGDB locations will be displayed on the map using a simple circle with a single - different color assigned to each layer. Symbol sizes will automatically adjust with the map scale. Outlines will be shown around the symbols when zoomed in past a certain scale with the exceptions of the cross and “x” symbol shapes.

Through this panel the symbols for each AGDB layer can be changed to create more complex maps. Symbol parameters that can be changed include: the shape of the symbol, and the color(s) used for the points.



### 1. Layer

Select AGDB layer to view or change its current symbol parameters

### 2. Symbol shape

Change shape of all symbols in layer. Options: circle, cross, diamond, square, triangle, “x”

### 3. Single color

Change the colors used by all points within the layer.

### 4. Classified colors

Assign colors to the points using the best value results for one of the element fields. All positive values in the selected field will be normalized using a base 10 log to reduce the influence of outliers before dividing them into five classes using the natural breaks (Jenks) method. An interactive blue to red color ramp of the break values with accompanying histogram will be added to the symbology panel.

The break values and max/min values of the classification can be manually changed to refine the appearance of the data. The values displayed with the color ramp will be the original data

values to remain consistent with values shown in other areas. Negative values, indicating results less than the detection limit of the analytical method, and null values are not included in the classification and are instead shown on the map using smaller gray circles. If the max/min range of the color ramp is decreased newly excluded values will also display as small gray circles.

Symbols will be assigned to all points. To remove points from the display, such as the negative or null values, use one of the filtering options.

## Area of interest panel

Filter points shown on the map from an AGDB layer by their geographic location. Setting an area of interest will also limit the points available in the attribute table, the download panel, the element groups panel, and the attribute filter panel. Setting an area of interest will not be restricted by any other filters that may already be in place.

### 1. Create area

There are three ways to define an area of interest.

- Create a box from the current map extent
- Draw a box on the map
- Draw a polygon on the map

### 2. Layer(s) to filter

Once the area has been set this section will be enabled and the AGDB layers can be filtered. A count of all the samples in the area will also be shown next to the layer name. This count is not restricted by settings in other filters. The area of interest can be applied to or removed from one or more layers without removing the area drawn on the map. To delete the box or polygon use the “Clear area” button at the bottom of the panel.

Area of interest

Create area

Layer(s) to filter

Sediment samples

Rock samples

Concentrate samples

Mineral samples

Soil samples

Leachate samples

Miscellaneous samples

Clear area

## Element groups panel

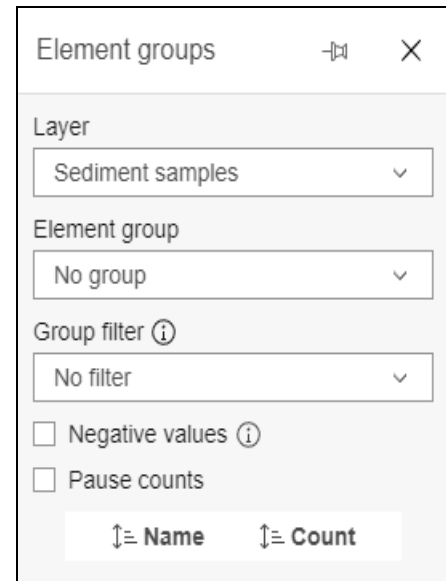
Provides access to sample counts and filtering options for eight preset element groups of interest. These groups are not separate fields in the database. Instead, they provide a quick way to query and filter data from multiple fields. The queries for each element will be for either all positive values, all positive and negative values if the group negative values box is checked, or a mix of positive and negative values if negative values are included using the attribute filter expressions and the group negative values box is unchecked.

For the selected group a table listing the element name and count of samples will be displayed. This table can be sorted by name or count. By default, the table will be sorted by name.

If a blue line is shown at the beginning of a table row this indicates that there is an expression for the element in the attribute filter panel. A blue line at the end of the table row means the negative values checkbox for the expression in the attribute filter panel has been checked and counts for the element will include negative values.

After selecting a group, the counts will automatically update when changes are made to the area of interest, group filter, or attribute filter unless the pause counts option is selected.

When a group filter is set an entry showing the filter parameters will be shown at the top of the expression list in the attribute filter panel for the corresponding AGDB layer. Group filters will limit the data available to all attribute filter expressions.



### 1. Layer

Select layer name to switch between the group information for each AGDB layer.

### 2. Element group

Select from these element groups.

- Base Metals – Copper, Lead, and Zinc
- Critical Minerals – Fifty minerals as defined by the USGS in 2022  
USGS, 2022, 2022 Final list of Critical Minerals: Federal Register, v. 87. No 37  
<https://www.govinfo.gov/content/pkg/FR-2022-02-24/pdf/2022-04027.pdf>.
- High-Field-Strength Elements – Hafnium, Niobium, Tantalum, Thorium, Titanium, and Zirconium
- Major Elements – Aluminum, Calcium, Iron, Magnesium, Manganese, Phosphorus, Potassium, Silicon, Sodium, and Titanium

- Precious Metals – Gold, Silver, Platinum, Palladium, Rhodium, Ruthenium, Iridium, and Osmium
- Light Rare Earth Elements – Lanthanum, Cerium, Praseodymium, Neodymium, Samarium, Europium, and Gadolinium
- Heavy Rare Earth Elements – Terbium, Dysprosium, Holmium, Erbium, Thulium, Ytterbium, Lutetium, Yttrium, and Scandium
- All Rare Earth Elements – Combination of Light and Heavy REEs

### 3. Group filter

Select from these filter options

- Partial suite – Sample must contain a value for one or more of the group elements
- Total suite – Sample must contain values for every group element

A count of all the samples remaining after applying the group filter will be shown next to the layer name in the group panel. This count can be restricted by the area of interest, but not by the attribute filter.

### 4. Negative values

Allow negative values in the queries for the counts and group filter. Negative values for an element indicate results less than the detection limit of the analytical method. Limit may vary within method and over time.

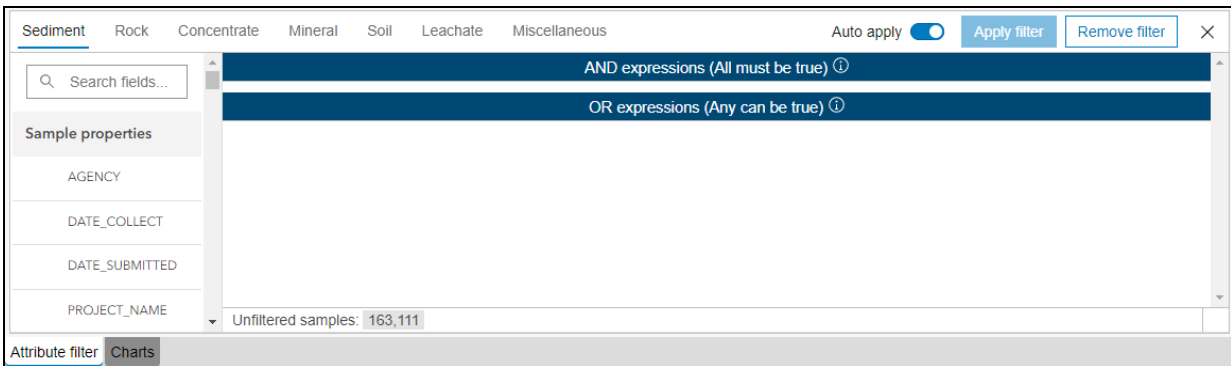
If this box is unchecked and negative values have been selected for one of the group elements in the attribute filter panel the checkbox will display an intermediate state, shown as a white horizontal line over a blue background, indicating that the filter and counts include a mix of positive and negative analytical results.

### 5. Pause counts

Stop automatic updating of the element counts in response to changes in the group or other filters. Will reset to off when the element group selection is changed.

## Attribute filter panel

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Opens in the bottom panel below the map. It can be used to build query expressions for filtering points in an AGDB layer based on their attributes. All attributes shown will be from the best value field for the element. Separate groups of queries can be built for each layer. Multiple queries for a layer can be chained together using AND or OR logical operators. This is the most detailed level of filtering available.

The filter interface is divided into three sections. A set of controls across the top, a list of field names on the left, and an area for expressions to display on the right.

### Attribute Filter » Filter controls

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#### 1. Layer tabs

Select layer name to switch between the field and query expression lists for each AGDB layer.

#### 2. Auto apply

Control if each change in the expression list automatically updates the layer in the map. Default is on. When off the attribute filter will be automatically removed from the layer when a change to the filter takes place.

#### 3. Apply filter

Manually apply query expressions to the layer when auto apply is off. This button is disabled by default. It will be enabled only when there are changes in the filter that have not been applied to the layer. For example, when the filter has been removed, or the auto apply switch is off.

#### 4. Remove filter

Removes the attribute filter applied to the layer. Does not remove the query expressions or remove element group or area of interest filters.

### Attribute Filter » Field list

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Searchable list of field names to add to the expression list. Fields are organized into the following groups.

## 1. Sample properties

Selected set of text fields describing who collected a sample and where and when it was collected. By default, these fields will be added to the AND section of the expression list. The initial query that will be set is for the field to be equal to the first unique value listed.

Expressions for text fields will contain three selection boxes after the field name and a footer section.

- Comparison operators – equals, not equal to, in list, not in list, is null, and not is null. List options allow for selection of multiple values.
- Attribute value – A list of unique values preceded by a count. Values and counts may be filtered by previous AND expressions, group filters, or an area of interest. Values listed can be searched by typing in the selection box.
- Logical operator – Move the expression between the AND and OR sections of the expression list
- Pause updates – Prevent currently selected attribute values from automatically updating when other filter expressions change. Previously loaded values can still be selected.

## 2. Elements

All best value analytical results fields in the database. Elements are listed alphabetically by their full name followed by the name of the database field in parenthesis. By default, these fields will be added to the OR section of the expression list. The initial query that will be set is for the field to be equal to the full range of unique positive min/max values for all analytical methods.

Expressions for numeric fields will contain five selection boxes after the field name and a footer section. Attribute values can be searched by typing in the selection box.

- Analytical method – A list of unique analytical methods preceded by a count. Select one or more methods to limit the unique attribute values for the element. Default is all methods allowed. Values and counts may be filtered by previous AND expressions, group filters, or an area of interest.
- Comparison operators – is between, is not between, equals, not equal to, less than, greater than, less than or equal to, greater than or equal to, is null, and is not null. List options allow for selection of multiple values.
- MIN attribute value – A list of unique values sorted in ascending order. Values may be filtered by previous AND expressions, group filters, or an area of interest.
- MAX attribute value – A list of unique values sorted in descending order, but otherwise identical to the MIN values. This box will be hidden when not using the “is between” or “is not between” comparison operators.
- Logical operator – Move the expression between the AND and OR sections of the expression list

- Pause updates – Prevent currently selected attribute values from automatically updating when other filter expressions change. Previously loaded values can still be selected.
- Negative values – A checkbox that can be used to include negative results in the list of unique values for an element. If the element is part of a currently selected element group, it can also be used to include negative values in the group filter and count.

These values indicate results less than the detection limit of the analytical method. Limit may vary within method and over time. Values may be filtered by analytical method, previous AND expressions, group filters, or an area of interest.

## Attribute Filter » Expression list

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Area to hold query expressions for selected fields. Divided into two sections based on logical operator.

### 1. AND expressions

Expressions listed in this section are chained together using the AND logical operator. Each of these expressions must be true for a point to display on the map. To assist with narrowing down the unique values the AND expressions work in a hierarchical manner. As each AND expression is added it will filter the attributes available to the expressions listed afterwards. This applies to both AND and OR expressions.

For example, if the QUAD field is selected first, it will provide a unique list with counts of all the quads in the state to select from. The second expression added to the AND section will have its unique values filtered by the selected quad(s). The unique list of attributes in each subsequent expression will continue to be refined as more AND expressions are added.

As AND expressions are added, removed, or set to new queries any expressions lower in the hierarchy will be automatically updated with new values unless “Pause updates” has been selected for an expression. By default, the first item in the list of unique values will be selected.

### 2. OR expressions

Expressions listed in this section are chained together using the OR logical operator. Any of these expressions can be true for a point to display on the map. One OR expression will not filter the unique values available to another OR expression. The unique attribute values listed in any OR expression will be filtered by all AND expressions.

### 3. Sample counts

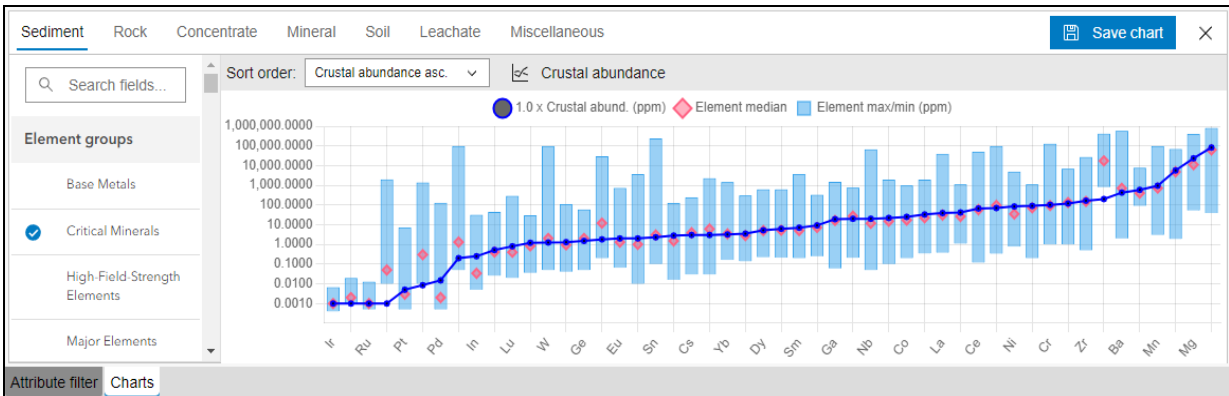
The footer section of the expression list provides a breakdown of the filters and their associated counts. Starting with the initial unfiltered count of samples in the layer each subsequent filter is listed in the following hierarchy:

Unfiltered samples » Area of interest » Group filter » Attribute filter



Entries will only be shown for currently active filters. If there are changes in the attribute filter that have not been applied, due to removing the filter or turning off the auto apply, the entry for the attribute filter counts will be shown with reduced intensity to indicate that the filter is not applied to the layer. While in this state the counts will continue to update, however.

## Charts panel



Opens in the bottom panel below the map. It can be used to create bar charts showing the max/min range and median of selected elements. Lines showing the average crustal abundance of the elements can be overlain on the bars. As filters are applied or removed from a layer the chart will automatically update. Hovering the cursor over a bar will display a tooltip listing the full name of the element, a count of the number of samples, and the values for max/min and median. Tooltips are also available for the crustal abundance points.

The chart interface is divided into three sections. A set of controls across the top, a list of field names on the left, and an area for charts to display on the right.

### Charts panel » Chart controls

#### 1. Layer tabs

Select layer name to switch between charts for each AGDB layer.

#### 2. Save chart

Save a copy of the currently displayed chart in the png image format.

#### 3. Sort order

Change the displayed order of elements in the chart. Options include:

Ascending/descending by crustal abundance

- Crustal abundance asc. (default)
- Crustal abundance dec.

Ascending/descending by max value

- Element max asc.
- Element max dec.

- Element name A-Z
- Element name Z-A

#### 4. Crustal abundance

Display one or more crustal abundance lines on the chart for the following multiples:

- 0.5 x Crustal background
- 1.0 x Crustal background
- 1.5 x Crustal background
- 3.5 x Crustal background
- 7.5 x Crustal background
- 15.5 x Crustal background

#### Charts panel » Field list

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Searchable list of field names to add to the chart. Fields are organized into the following categories.

##### 1. Element groups

Select from these element groups:

- Base Metals – Copper, Lead, and Zinc
- Critical Minerals – Fifty minerals as defined by the USGS in 2022
  - USGS, 2022, 2022 Final list of Critical Minerals: Federal Register, v. 87. No 37  
<https://www.govinfo.gov/content/pkg/FR-2022-02-24/pdf/2022-04027.pdf>
- High-Field-Strength Elements – Hafnium, Niobium, Tantalum, Thorium, Titanium, and Zirconium
- Major Elements – Aluminum, Calcium, Iron, Magnesium, Manganese, Phosphorus, Potassium, Silicon, Sodium, and Titanium
- Precious Metals – Gold, Silver, Platinum, Palladium, Rhodium, Ruthenium, Iridium, and Osmium
- Light Rare Earth Elements – Lanthanum, Cerium, Praseodymium, Neodymium, Samarium, Europium, and Gadolinium
- Heavy Rare Earth Elements – Terbium, Dysprosium, Holmium, Erbium, Thulium, Ytterbium, Lutetium, Yttrium, and Scandium

##### 2. Elements

All best value analytical results fields in the database. Elements are listed alphabetically by their full name followed by the name of the database field in parenthesis.