

THE NEW GEOSCIENCE ATLAS

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ABSTRACT

The Geoscience Atlas is Newfoundland and Labrador's website to view, query and output geoscience datasets from the Provincial Government. The Atlas was recently upgraded to a new server technology, with a new organization, new tools and new layers, as well as updates to some of the older layers.

Access to the Atlas is through the GeoScience OnLine webpage, as it provides not just a link to the Atlas and other online resources, but also announcements, such as scheduled maintenance times when the Atlas or specific layers may be unavailable.

New additions to the Atlas tools include a tool to share the map view with a colleague, draw graphics and text on the map, download both vector and raster data in a variety of formats, more custom query forms, print to scale and bookmark window extents. New layers include numerous Atlas base maps and base maps from external sources, coastal monitoring layers indicating coastal erosion and characterization, hydrogeology, and numerous detailed airborne geophysics images of western Labrador and western Newfoundland.

Future upgrades include the reorganization of the Indexes Group, the addition of tools to provide summary reports, links to more data, photos, maps and reports to provide streamlined access to all geoscience data and information for the Province.

INTRODUCTION

The Geoscience Atlas is Newfoundland and Labrador's (NL) website to view, query and output geoscience datasets from the Provincial Government. Access to the Atlas is through the GeoScience OnLine webpage. The goal of the Geoscience Atlas is to provide easy access to the geoscience data and information of the Province in a map-based spatial format with numerous links to related data contained in sites, such as the bibliographic Geofiles (<http://gis.geosurv.gov.nl.ca/minesen/geofiles/>), Mineral Licence Inquiry Reports (<http://gis.geosurv.gov.nl.ca/mrinquiry/mrinquiry.asp>) or MODS Cards (<http://gis.geosurv.gov.nl.ca/mods/mods.asp>).

The Geoscience Atlas was recently upgraded to a new server technology, with new tools and new layers as well as updates to some of the older layers. A number of new base maps are available to provide spatial reference for the point, line and polygon layers.

This overview of the Atlas will focus on groups of tools, such as the Search and Query tools. A linear, step-by-step

approach to the Atlas can be found in the Atlas Help file (<http://geoatlas.gov.nl.ca/custom/help/help.html>) and the Atlas Tutorial slides (http://geoatlas.gov.nl.ca/custom/help/Help_AtlasTutorial.pdf).

GEOSCIENCE ONLINE

Geoscience Online provides links to the Geoscience Atlas, as well as links to provincial Mines Branch Services and Energy Branch Services as well as National GIS Resources. It is recommended to access the Geoscience Atlas through the GeoScience OnLine webpage (<http://gis.geosurv.gov.nl.ca>), as it provides announcements on scheduled maintenance times when the Atlas may be unavailable, or if specific layers are down for maintenance. The Geoscience Online webpage also provides a link to the *What's New* page, listing recent updates to the Atlas, and an email link (GeoscienceOnline@gov.nl.ca) for any questions or comments on the Atlas.

Access to the Geoscience Atlas is through the *Interactive Maps* link, by clicking on the image of Newfoundland and Labrador or going directly to <http://geoatlas.gov.nl.ca>.

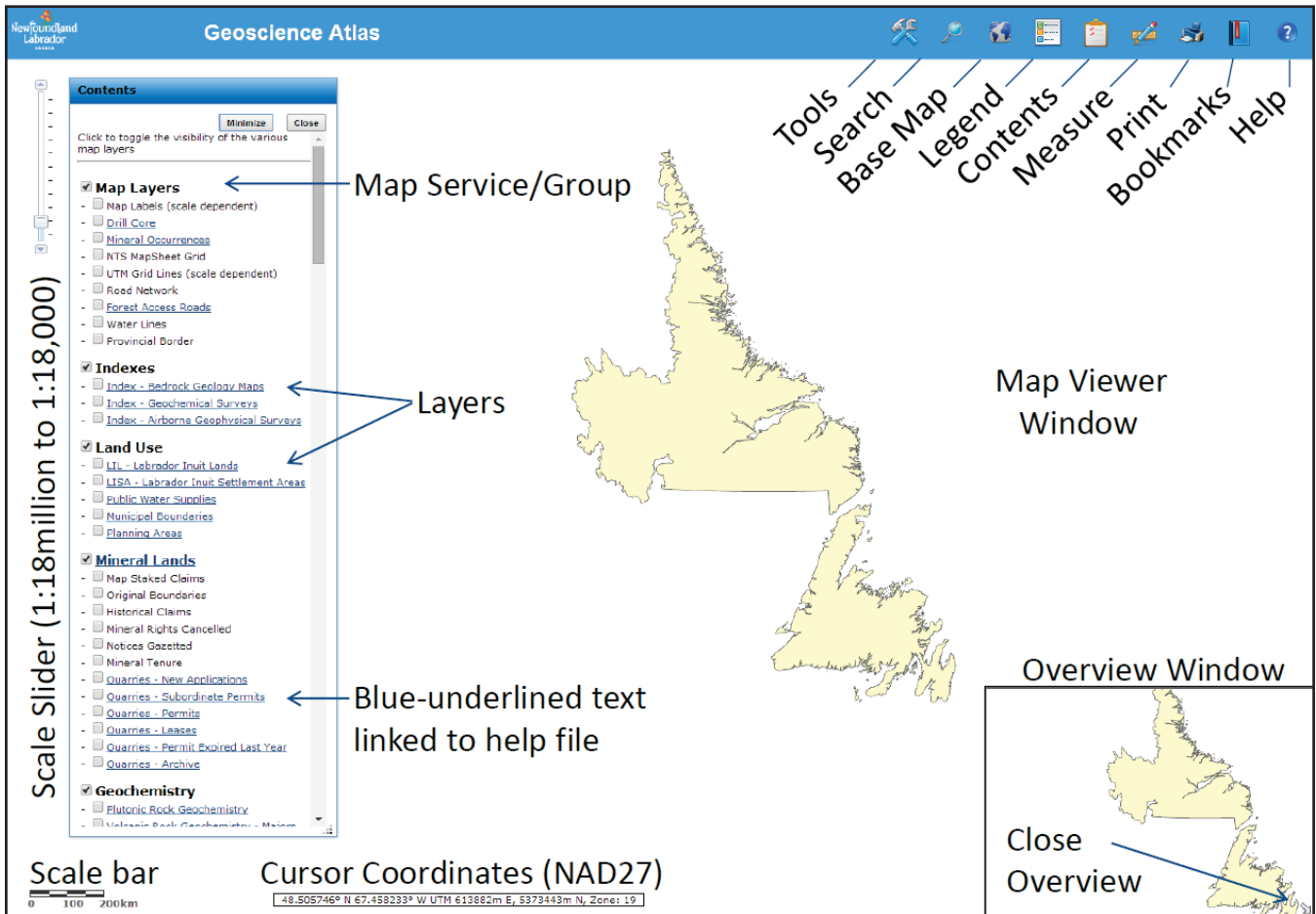


Figure 1. The Geoscience Atlas default page with scale slider and contents panel on the left, scale bar, cursor coordinates (based on datum NAD27) and overview window along the bottom and menu's across the top of the Map Viewer window.

GEOSCIENCE ATLAS

The Geoscience Atlas default page (Figure 1) opens to a regional view of Newfoundland and Labrador with the Contents panel on the left and the pull-down menus along the top. The coordinates along the bottom of the map view are latitude and longitude, and UTM based on the NAD27 datum. The overview window can be toggled on and off by clicking on the white arrow in the lower right corner. A new feature of the Atlas is the ability to retain a memory of the map extents and open layers when it is subsequently opened; to utilize this feature the internet browser settings should be set to 'remember history' or 'allow cookies'.

Further information on the layers and tools is available in the *Atlas Help* file through the *HELP* icon. An overview of the Atlas is provided in the *Atlas Tutorial* slides located at the top of *Atlas Help*.

NAVIGATION AND TOOLS

Most of the tools in the new Geoscience Atlas are sim-

ilar to the old Atlas, but there are new tools and methods of navigating around the Atlas. The following list describes methods to navigate (zoom and pan) around the map viewer window:

1. Roll the mouse roller to *zoom in/out*,
2. Drag the zoom slider, on the left side, to *zoom in/out*,
3. Hold down the *shift key* and drag a box on the map to *zoom in*,
4. Hold down *Ctrl+Shift* and drag a box on the map to *zoom out*,
5. Click the map and drag the mouse to pan the map,
6. Click the shaded box in the overview map, on the lower right, and drag it to a new location to quickly pan the map.

There is no longer an Identify tool – this has been replaced by a simple click of the cursor that will display tabular data in the *Search Results* window for any of the open vector layers but not for the raster images.

The main set of tools is in the *Tools* menu and consist of *Share Map*, *Draw Graphics*, *Spatial Search*, *Add Map*

Service, *Download Data*, *Attribute Query* and *Custom Queries*. A description of these tools is provided in the *Atlas Help* file (<http://geoatlas.gov.nl.ca/custom/help/help.html>) as well as the *Atlas Tutorial* slides (http://geoatlas.gov.nl.ca/custom/help/Help_AtlasTutorial.pdf).

LAYERS AND BASE MAPS

Layers

The Contents panel provides access to over 150 layers of data, ranging from *Map Labels* to regional Newfoundland and Labrador *Residual Magnetics* images in the *Geophysics Group*. The groups consist of:

- Map Layers
- Coastal Monitoring
- Indexes
- Land Use
- Mineral Lands
- Geochemistry
- Bedrock Geology
- Surficial Geology
- Geophysics

The order of the groups is important. If the groups are not in the above order then a layer of images or polygons may cover a layer of points or lines. To reset the order, click on the refresh/reload button (↻) once or twice. Note that the order of the layers in the Contents panel is the same order as in the drop-down lists, such as in the *Download* or *Attribute Query* tool lists.

Most of the groups are self-explanatory but some of the groups require more explanation. The *Map Layers Group* is a miscellaneous set of layers consisting mainly of topographic layers (place names, NTS mapsheet outlines, UTM grid lines, roads, rivers, shorelines, provincial border and elevation contours) but also includes *Drill Core* and *Mineral Occurrence* datasets. The new *Coastal Monitoring Group* consists of layers providing coastal erosion rates, geomorphology, sedimentology, sensitivity and petroleum vulnerability. The *Indexes Group* provides bounding polygons, and links to further information, for *Bedrock Geology Maps*, *Geochemical Surveys* and *Airborne Geophysical Surveys*. The layers in the *Land Use Group* are from other departments. They include the *Labrador Inuit Lands* area and the *Public Water Supply* areas that have restrictions on what can be done within the area boundaries. The *Geochemistry Group* now includes both the geochemistry element layers (e.g., plutonic rocks, lake sediments) as well drop-down lists of over 200 sublayers of geochemical data, consisting of dot plots, interpolated element images and contours derived from those images. This provides more flexibility in displaying many data layers at the same time. The *Geophysics Group* contains over 90 geophysical images

from the west coast of the Island as well as western Labrador (Figure 2). The last two images consist of the regional magnetics for all of Newfoundland and Labrador. A white *Water Lines* layer is available at the top of the *Geophysics Group* to overlay on the geophysics images.

Base Maps

Five base maps (Figure 3) are available to provide a topographic reference for the layers in the Contents panel. These can be accessed through the *Base Map* icon on the menu bar. There are two vector-based topographic maps, *Topographic* and *Outline Topo*, that display lakes and rivers, building locations, built up areas and power lines (red dashed lines) at the most detailed zoom level. The *Scanned Topo* base map displays mosaicked scans of the 1:250 000- and 1:50 000-NTDB topographic paper maps. Some of these maps are based on the NAD27 datum and others on the NAD83 datum, so the scanned UTM grid lines may not match up with the NAD27 *UTM Grid Lines* layer in the *Map Layers Group*. The fourth base map is the *Grey Topo* base map. It provides a simple, clean layer to overlay other information on. The last base map is the *Grey Topo DEM* (Digital Elevation Model). It displays a shaded-relief elevation image developed from the Shuttle Radar Topography Mission (<http://www2.jpl.nasa.gov/srtm/>).

None of the base maps are available to query or download. Further information on all the layers is provided in the *Atlas Help* file under the *List of Layers* link in the *Base Maps* section.

Map Services

Another set of base maps can be obtained from the Tools menu under the *Add Map Service* tool. Under the *ArcGIS Server* type, click on the drop-down list to pick the default *ArcGIS Online* rest services (<http://services.arcgisonline.com/arcgis/rest/services>). Click on the *Get Services* button to provide a list of over 20 world base maps, such as *ESRI Imagery World 2D*. To overlay the Atlas layers on these *Map Services*, click on the *Reorder* tab, scroll to the bottom of the list and move the *Map Service* layer up to the top. This list indicates the draw order of the layers and that the *ESRI Imagery World 2D* will draw first. This *Reorder* list cannot be used to reorder the other layers. Note that these *Map Services* are based on the WGS84 datum and so the Atlas layers, based on NAD27, will not overlay exactly at larger scales.

SEARCH AND QUERY

Search Tool

The *Search* tool, on the main menu bar, provides a text-

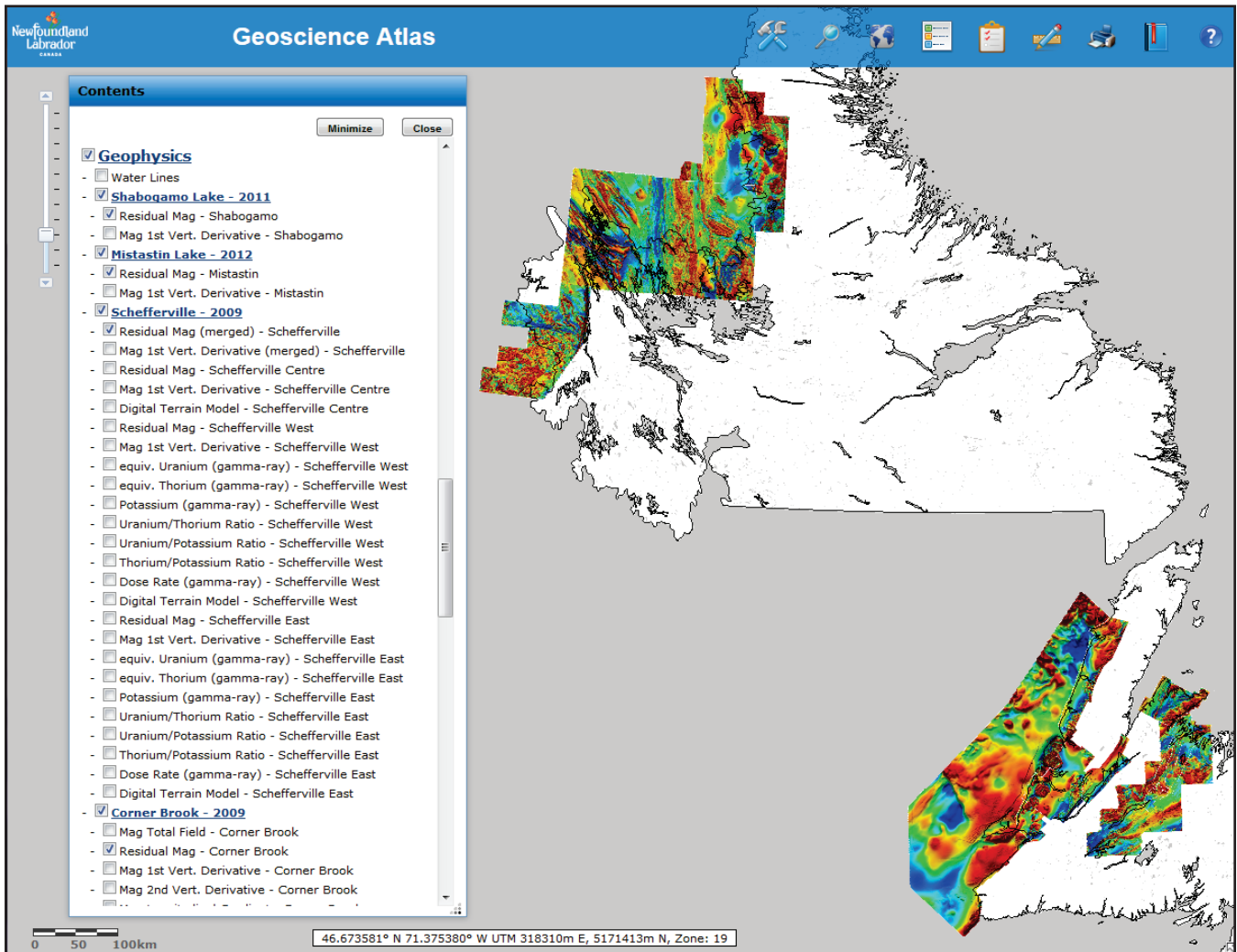


Figure 2. Detailed geophysics (in this case, residual magnetics are shown) from 12 detailed surveys.

based search of any or all the data layers. Click on the *Search* icon (🔍) and then click on the drop-down list to select *All*, select a group or select an individual layer, such as *Detailed Bedrock Geology*. Type the word to search for, such as *granite*. This will find all the features that contain *granite* in the associated attribute table(s) and highlight them on the map.

The *Search* tool can also search location place names by clicking on *Location*. Type the location name, such as *postville, NL*. Capitals are not necessary, but the province and sometimes country are necessary to distinguish the place from other places in the world. If the map view shifts to a blank white screen, click the *Bookmark* icon on the menu bar to locate the map view back to Labrador, Newfoundland or the default Initial Extents. A right click on the red search location dot (Figure 4) provides access to *Google Street View* and *Bing Bird's Eye view*, as well as direct access to the *Spatial Search* tool, where this location is automatically entered into the *Graphic* selection.

Spatial Search

Spatial Search is available through the *Tools* menu. It can be performed on features in the map display using either *Graphic* selection or *Current* selection (Figure 5). The *Graphic* is based on graphics that have been drawn on the map display using the *Draw Graphics* tool. To create a new graphic, access the *Draw Graphics* tool by clicking on the *Add Graphic* button (+) to the right. Previously created graphics are listed in a drop-down list and can be selected for use. Any features that overlap this selected graphic and a buffer around the graphic, will be highlighted on the map while the records will be returned in the *Search Results* window.

Records listed in the *Search Results* window, whether from a *Spatial Search*, a query or by clicking on a feature, can be used in further *Spatial Searches* by clicking on the *Overlap – Current Results* option. This option bases a new search on any features, such as polygons in the *Detailed*

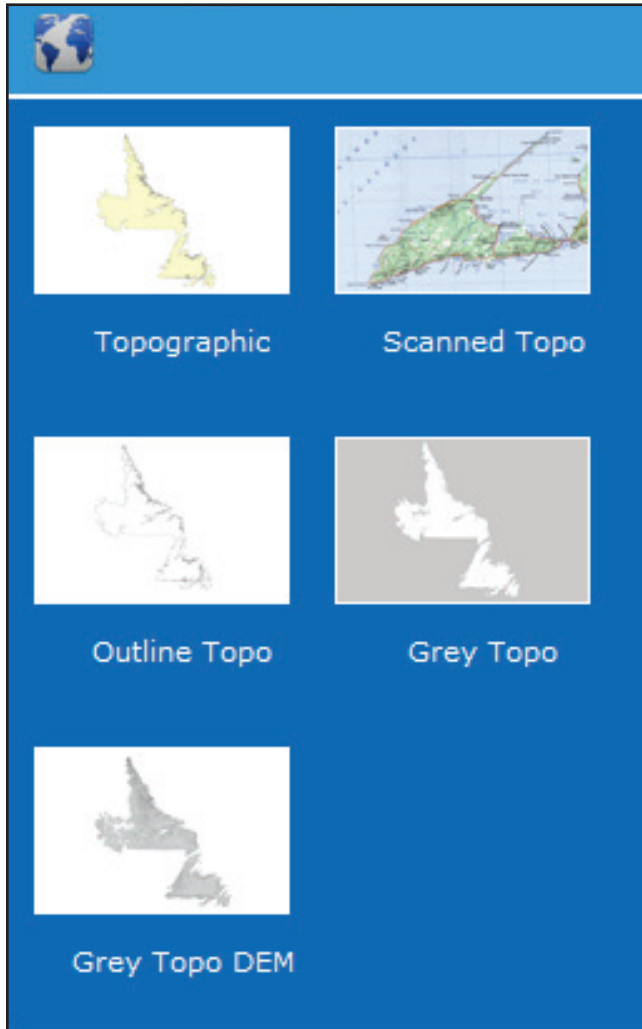


Figure 3. Base Maps available to add as spatial reference for the layers in the Contents panel.

Bedrock Geology layer, overlapping a current result or a buffered current result.

Attribute Query

The *Attribute Query* tool, in the *Tools* menu, provides the ability to question the various vector layers (*i.e.*, layers that contain associated tabular data) by using the structured query language (SQL) method. The dialogue box (Figure 6) provides drop-down lists to select the layer and attribute (field) of interest. The Operations, such as *Equal To* or *Greater Than*, are also provided in a drop-down list. Click on *Get Sample Values* to populate the drop-down list of values for that attribute; if there are too many values then this list will only provide an **example** of the values in that field. To enter a value not on the values list enter it manually in the box below. Then click *Add to Query Expression* and run the query. The query expression cannot be manually edited in the expression box.



Figure 4. Search for a Location and access Google Street View, Bing Bird's Eye view or use the location for a Spatial Search.

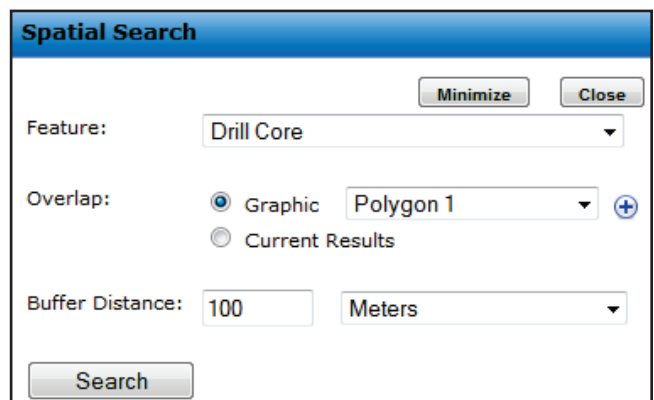


Figure 5. Spatial Search dialogue box where drillcore locations will be selected if they overlap the graphic Polygon 1 and a 100 m buffer around the polygon.

Custom Query

The *Custom Queries*, also in the *Tools* menu, are organized as forms listing common queries for 17 layers. For example, a common query for the *Map Staked Claims* layer is 'What claims have been staked in the last few days'. Entering the *Start Stake Date* and running the query will provide a *Search Results* window listing the latest claims staked between the start date and the current date (the default end date).

Attribute Query

Minimize Close

Layer: Mineral Occurrences

Attribute Selection

Attribute: COMMODS

Operation: Like

Value: [Get Sample Values](#)

Gold

Add to Query Expression

Query Expression

Clear () AND OR NOT

COMMODS LIKE '%Gold%'

Run Query

Figure 6. A search for gold mineral occurrences using the Attribute Query dialog box.

Other layers with *Custom Queries* are *Mineral Occurrences*, *Drill Core*, all the *Index* layers, all the *Mineral Lands* layers and *Stratigraphic Units*. The *Stratigraphic Units* are queries based on the *Detailed Bedrock Geology* layer. It provides the ability to search based on *Group Names*, *Formation Names* and/or *Rock Types*. For example, to select all the *Victoria Lake Group* polygons enter 'vict' in the *Group Name contains* box (Figure 7). The selected database records will be listed in the *Search Results* window and highlighted in cyan on the map. These records can then be downloaded in shape file format, or the results can be used to do a *Spatial Search* such as obtaining all the mineral occurrences that fall within that Group.

Instructions and examples of *Custom Queries* are provided in the *Search and Query Help* file (<http://geoatlas.gov.nl.ca/Helpcustomquery.htm>), accessed by going to the *Help* link at the top right of the *Custom Queries* dialogue box. This help file provides descriptions and examples for all the search and query tools in the Atlas.

Cursor Query

To obtain information about a feature (point, line or

Custom Queries

Minimize Close

Custom Query: Stratigraphic Units [Help](#)

Group Name contains vict

Formation Name contains

Rock Type contains

Run Custom Query Clear

Figure 7. Custom Queries dialog box. In this example it is used to select detailed geology polygons from the Victoria Lake Group by searching for 'vict' in the Group Name field.

polygon), simply click on it. Any features at the cursor location that are visible in the map window (*i.e.*, turned on) will have their attribute data displayed in the *Search Results* window. This data can then be downloaded as a shape file.

Search Results Window

The *Search Results* window displays the tabular attributes (fields) for features (points, lines or polygons) selected using one of the above search or query methods. If data from more than one group is displayed (Figure 8) select the group from the *Map Service* drop-down list, and then the specific layer from the *Results* list. The number of features selected will be listed in the *Search Results* box. A maximum of 1000 records can presently be listed but this will be increased in the future. Those features that are listed will be highlighted in cyan in the map view.

Search Results can be downloaded using the *Download* link just above the tabular data. Only the shape file format is available to be downloaded from this link. If only the tabular data is of interest, as opposed to the location of the data, it can be accessed through the .dbf file from the downloaded

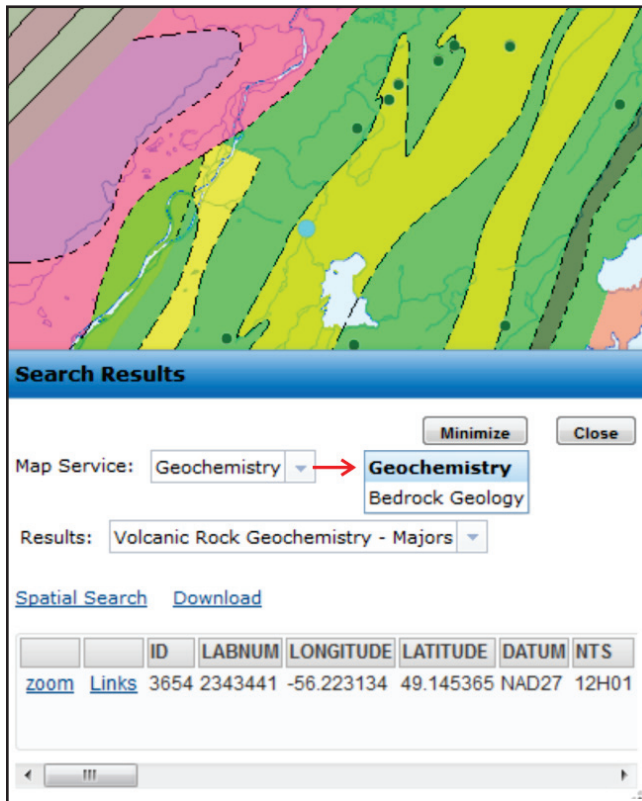


Figure 8. Groups are listed in the Search Results window under Map Service. Select the Group first, then select the layer in the Results drop-down list.

data and opened in many spreadsheet programs. The data can also be manually selected from the Search Results window and copied and pasted to a spreadsheet program.

To the left of each record in the Search Results window there is a *zoom* function; this will zoom to that record's feature (point, line or polygon), center it in the map view and highlight it in red. Many databases also have *Links* to related data. For example, *Mineral Occurrences* will link to further information contained on their MODS cards, and *Map Staked Claims* and *Historical Claims* link to both the *Mineral License Inquiry* reports as well as any assessment reports contained in the *Geofiles* database.

OUTPUT: DOWNLOAD AND PRINT

Download Data

The *Download Data* tool, in the *Tools* menu, has been enhanced to download both vector (features such as points, lines and polygons) and raster (image) formats. Only geoscience data is available for download; no topographic or *Land Use* data can be downloaded. The layers in the drop-down list are in the same order as in the *Contents* panel. The layer does not have to be turned on to download it. For vec-

tor features, only the data within the extents of the map window are downloaded. For raster images, the whole image is downloaded regardless of the map window extents. A number of formats are available to download the data, including shape files for vector data and geotif's for raster images. The downloaded file coordinate system is latitude-longitude based on the datum NAD27. Only one layer at a time can be downloaded. Vector data can be downloaded through the *Search Results* window as well. This will encompass only the data that is listed in the *Search Results* window.

Print Tool

The *Print* tool, on the main menu bar, provides access to various printing methods. Set up the map viewer with the layers and extent of interest. Then click on the *Print* icon to see a preview of the map. Scroll to the bottom of the window to view the *Custom* print options on the left and *Quick* print options on the right. The main feature of the *Custom* print options is its ability to print to scale. It also provides for the input of a title and the choice of a number of map templates on different paper sizes and orientations. If *Drawn Graphics* are used, they will **not** be included on the custom map. The output is provided in pdf format.

The *Quick* print options, on the lower right side, do include *Drawn Graphics*. The *Print Image* button sends the preview map straight to the chosen printer. The *Save Image* button will open the map in a new browser window where it can be copied and pasted to another program or saved as a bmp or png file, depending on what browser is being used. The *Save Image as PDF* and the *Print Legend* buttons are self-explanatory. Note that the legend contains all the symbology (including point symbols, line styles and polygon colours) for all layers turned on and not just for features visible in the print preview extents. The legend does not display symbology from the base maps, road networks or images.

HELP FILES

All the layers of data have associated help files. Most layers have help files linked to their layer name but some help files are linked to the group name indicated by the blue underlined text in the *Contents* panel. All the layers also have a brief description in the *List of Layers* help file.

The *Atlas Help* file, in the *Help* menu on the main menu bar, provides a brief description of all the Atlas tools as well as links to other help files, such as *Frequently Asked Questions (FAQ)*, *List of Layers*, and the *Search and Query* help file.

The *Frequently Asked Questions* file provides answers to common questions such as:

- What is the projection and datum of the Atlas versus

downloaded data,

- What do you do when the Atlas does not perform as expected (*e.g.*, does not return tabular data in the *Search Results* window),
- Where do you get symbology to apply to downloaded GIS data, and
- What to do when the layers in the *Contents* panel are not in the correct order.

As mentioned above, the *List of Layers* help file describes each layer in the *Contents* panel as well as the base maps. It also provides links to the *What's New* file and the online mineral *Claim Staking* system.

The *Search and Query* help file provides more detailed instructions on how to run the search and query tools consisting of *Spatial Search*, *Attribute Query*, *Custom Queries*, *Search* (on the main menu bar) and *Identify*. This help file is still under construction and will have more graphics and examples added in the future.

FUTURE PLANS

Many of the future plans listed in the 2013 Current Research (Honarvar *et al.*, 2013) are summarized here as they were sidelined while this new Atlas was being developed. The *What's New* file will provide an update of recent changes.

The next set of upgrades to the Atlas will occur in the *Indexes Group*. This *Group* presently consists of the spatial extents or NTS map overlap of geological, geochemical and geophysical reports, maps and data. New indexes, such as *Surficial Geosciences* and a *Publications* index, will be added to provide links to surficial geology maps, aggregate maps and published reports.

The *Detailed Geology* of Labrador has begun to be compiled, starting with the maps in the southeast (Gower, 2010) and working inland to the west and north. As a first step, this information will be made available on the Geo-

science Atlas for download as vector polygon and line files with the original geological unit attributes included but without a common legend theme or colour set.

New tools will be developed, such as a tool to provide a geology map legend that limits the units to just those within the map extents. A tool to provide a comprehensive list of all data, reports and maps available for a specified area of interest will also be developed.

The Atlas itself will be upgraded so that the layers in the *Contents* panel are collapsed in their groups (*i.e.*, hidden until the group is opened), so more layers, such as more detailed geophysics images, can be added in the future.

Overall, the Geoscience Atlas will become more streamlined to provide easier access to the geoscience data and information for the Province.

ACKNOWLEDGMENTS

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