Overview

COrntrol Survey Iformation Exchange (COSINE) Online is the online web application to access the provincial geodetic control database for Ontario.

Horizontal and vertical geodetic control survey data is available to users free of charge. To view geodetic control monument locations in your area of interest use the pan, zoom, or search tools. Use the Control Monument Selection tool to select the desired monuments and click Search to retrieve the official coordinates, elevations, reference sketches, and other data.

This document provides Help for users of COSINE Online, including information on how to navigate the map interface, find control survey monuments, measure distances, and print maps, reports, and reference sketches.

Launch COSINE Online (Ontario-wide View): http://www.giscoeapp.lrc.gov.on.ca/cosineONT/Index.html?site=cosine&viewer=OntarioViewer

or, Launch COSINE Online (Toronto View): http://www.giscoeapp.lrc.gov.on.ca/cosineTOR/Index.html?site=cosineTOR&viewer=TorontoViewer

Note: COSINE Online is optimized to run in Internet Explorer 9+, Firefox 30+, and Chrome 36+. Users with IE 8 and earlier may experience decreased functionality in the application.

Additional Information

We want your feedback. Please email details regarding missing, destroyed, or disturbed control survey monuments to geodesy@ontario.ca. If there are questions regarding the coordinate values and/or elevations assigned to a control survey monument in COSINE, please address your questions or concerns to geodesy@ontario.ca.
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COSINE Station Names

Standard COSINE station names are in the format *aaayyyynnnn*, where:

- **aaa** is a three-character agency code (e.g., 001 for NRCan, 008 for MTO, and 010 for MNRF),
- **yyyy** is a four-digit year, and
- **nnnn** is normally a string of four digits, but may be shorter or longer and in some cases involve one or more letters.

Previously, the standard allowed only two-digit years and had prefixes (V, 7, 8, etc.) for certain types of stations. Most stations in COSINE have been renamed in accordance with the new standard in terms of their primary name in the COSINE database (the older forms of names are retained in COSINE as alternate/alias names). As time permits, the remaining stations using the older station naming convention will be revised to comply with the new standard, and the older name will be retained as an alternate/alias name in the COSINE database. Please note, that the name physically stamped on the COSINE control monument at the time of installation will not change, and should match one of the primary or alternate (alias) names stored for the control station in COSINE. Some stations do still have a ‘V’ suffix to differentiate a vertical station that has an otherwise identical name to another, unrelated, horizontal station. For this reason, when searching for a station via the COSINE name in Text Search / Add to Map Selection tool, it is recommended to use the Station Prefix search.

For example, if 01019790301 were searched in the Station Name box in the Text Search / Add to Map Selection tab, one station would be retrieved: A horizontal control monument located between Brethour & Casey townships. But if that same name was searched in the Station Prefix box, two stations would be retrieved:

- 01019790301 – The horizontal control monument in Brethour & Casey Twp; and
- 01019790301V – A vertical benchmark in the Town of Englehart.

Some examples:

1. Suppose that you have a monument with the stamp 84U0238. From other markings on the monument or through experience, you know that the station is a Canadian Geodetic Survey one (contains a ‘U’). In COSINE, the appropriate prefix is 001, the year is 1984 and the full COSINE name of the station must be 0011984U0238.
2. Suppose you find a marker in the field stamped MTC – 763237. MTC is the Ministry of Transportation Ontario, so the prefix could be 008 or 009, the year is 1976, and the ID is 3237. The COSINE name would be 00919763237.

See Appendix C for a list of agency codes.
Interface Overview

There are two “views” in the COSINE Online application:

- Ontario-wide View – For viewing all geodetic control in Ontario.
- Toronto View – For accessing Toronto-specific control with a report format customized to meet the needs of the City of Toronto.

The interfaces of these two views are very similar; the main differences are the style of the Standard Report format which includes a table of local ties at each station, and smaller format reference sketches with a diagram of the local ties also included. Also, in the Toronto-view there is a tool under the Search For/Zoom To tab for searching Toronto road intersections.

Tools are organized into tabs, located across the top of the page. Various information is displayed in the panel on the left, and results and reports are displayed in a panel that opens on the bottom, below the map. This guide contains sections about each toolbar tab in the application.
About Tab

The About tab provides information about the COSINE Online application and is also home to the COSINE Online Help Guide.

About

Click the **About** button for relevant information about the application tool.

Help

Click **Help** to open the main COSINE Online Help Guide with details on how to use the COSINE Online interface and retrieve geodetic control survey data.

Additional Options

**Full Screen:** The application can be switched to full screen mode using F11 on the keyboard. Use the key again to return all tabs and browser elements to their normal state.

**Hide Sidebar Panel:** This button can be used any time to close any left sidebar panel to provide a larger view of the map.

**Languages:** The hyperlink to switch between English and French language is located in the upper-right corner of the window.

**Open Toolbar:** Hides the toolbar tabs when clicked once. Click again and it restores the toolbar.

**Overview Map:** Open by clicking the arrow icon, located at the bottom-right corner of the map view.

Click and drag the blue box within the Overview Map and the view will also move. To close the overview map, click the arrow button again.
**Scale:** The scale bar adjusts with the map view and shows the real-world scale of distances on the map view.

![Scale Bar](image)

**Coordinate Widget:** Click to open the Coordinate Widget. Select between Lat/Long (decimal degrees) and Degrees/Minutes/Seconds to toggle the format that the coordinates are shown in. The coordinates update as you move the cursor across the map.

![Coordinate Widget](image)

**Recently Used Tools**

As tools are used on the interface, the most recently used tools are displayed across the bottom of the left panel of the map display, to the left of the Coordinate Widget. In the above image, five recent tool links are shown: Select Map Layers, Search Monument, Geographic Names Search, Zoom To Map Coordinates, and COSINE Ontario-wide Retrieval. Click on any icon to go back to that tool or result.

**Toggle Between COSINE Views**

Switch to COSINE Toronto Switch to COSINE Ontario

This button located in the top-right corner of the application can be used to switch between the Ontario-wide and Toronto Views of COSINE Online.
The I Want To… button provides quick access to several frequently-used tools.

**Find a Control Monument**: refer to [Search For/Zoom To](#) for further information on searching survey control monument.

**Measure Distance**: refer to [Distance Tool and Printing](#) for further information on measuring distances.

**View Satellite Imagery**: changes the map view to Ontario satellite imagery.

**View Base Map**: changes the map view to the Ontario Base Map.

**Change visible map layers**: refer to [Map Layers](#) for further information on how to turn map layers on and off.
**Printing:** refer to [Distance Tool and Printing](#) for further information on how to create and print a custom map.

**Bookmarks:** A list of all bookmarks opens to the left of the map for addition or review of bookmarks. For further information on bookmarks refer to [Navigation](#).

**Return to initial map extent:** Click to zoom out to the original view of the map.
The Navigation tab provides tools for moving around in the map view and to create and view **Bookmarks**.

**Bookmarks**

The **Bookmarks** toolbar allows the user to add new locations and store them in a list. The window opens into the map view.

- Zoom to a desired location
- Click the Bookmarks button, then **Bookmark Current Extent**
- Type a name for the location
- Click OK or press Enter
- The location is added to the bookmarks list. The X to the left of the bookmark will remove it.

**Pan**

**Pan** moves the map view around. Click and drag the map or use direction keys on the keyboard to move the viewable area.

**Zoom In**

Select the tool and click and draw a box around an area of interest to zoom in, or use the mouse scroll-wheel. Double clicking on the map also zooms in.
**Zoom Out**

Select the tool and click and draw a box around an area of interest to zoom out, or use the mouse scroll-wheel.

**Initial View**

**Initial View** returns to the original view of the map. For the *Ontario-wide Viewer*, this is the full Province view. For the *Toronto Viewer*, this is the extent of the City of Toronto.

**Previous Extent**

**Previous Extent** returns to the previous view.

**Next Extent**

**Next Extent** will be greyed out until the user has clicked **Previous**. Click to step through past views.
Map Layers Tab

The Map Layers tab contains Select Map Layers, a tool for turning map layers on and off, and the Legend.

Select Map Layers

Turn layers on and off using Select Map Layers. The COSINE control survey monuments are found under the COSINE layer, then the Station Data layer. Data is grouped into two groups: Horizontal Stations (including NAD27, NAD83, and NAD83-CSRS datums), and Vertical Stations which include CGVD28 and CGVD2013 datums, and HT2.0 elevations.

To see the symbology of the layers, click the icon that resembles a small bulleted list, located to the left of the “Horizontal Stations” or “Vertical Stations” items:

Private Sector Real Time Kinematic (RTK) provider networks are a separate layer under the COSINE group.

Destroyed/Unknown Stations are in a separate layer under the COSINE group and are turned off by default. To view monuments with Destroyed status, turn on this layer.
The check marked boxes indicate if the layer is visible. To turn off a layer, uncheck the box. Transparency is also available for users to view underlying layers. For example, adjust the transparency slide bar on Topographic Data to see through to the Ontario Imagery.

**Legend**

The **Legend** describes the types of features included in the application and provides symbols showing how the features are represented. The legend is provided in French and English.
Below the COSINE legend is a button to switch to the legend for the Ontario base topographic backdrop.

A detailed explanation of the legend symbols is provided in Appendix B.

**Horizontal Stations**
- ▲ First Order
- ▲ Second Order
- ▲ Third Order
- ▲ Fourth Order
- ▲ Toronto Third Order

**Vertical Stations**
- ■ First Order
- ■ Second Order
- ■ Third Order
- ■ Fourth Order
- ■ Toronto Vertical Third Order

**Unknown or Missing Stations**
- + Destroyed/Unknown Stations

**NAD83-CSRS Stations**
- ♦ Class A
- ♦ Class B
- ♦ Class C
- ♦ Class D
- ♦ Class E
- ♦ Class A with Other Horizontal
- ♦ Class B with Other Horizontal
- ♦ Class C with Other Horizontal
- ♦ Class D with Other Horizontal
- ♦ Class E with Other Horizontal

**RTK Providers**
- ★ Leica SmartNet Stations
- ★ Cansel Can-Net Stations
- ★ Topcon TopNET Live Stations

☐ Assessment Parcel
☐ Geographic Township
Search For/Zoom To Tab

Search for Monument

Allows a quick search of the map interface for a specific COSINE survey marker, based on COSINE name (i.e. 00119963021). This will identify and zoom to the monument on the map, but to retrieve details of the monument, you must use the Control Monument Selection tool.

Search for Geographic Name

Provides search functionality for any Ontario municipalities, townships, parks, conservation reserves or named geographic features such as lakes, bays, rivers, islands, and unincorporated places. Simply enter a search term and click Search. You can optionally also select a type of feature from the pull-down menu to limit the search results (i.e. only search for “Lakes”).

Zoom to Coordinates

If you are looking for geodetic control in the vicinity of known geographic coordinates, you can use the Zoom to Coordinates tool. Coordinates can be entered in UTM, or Degrees, Minutes, Seconds (DMS), or Decimal Degrees (DD) format.

- Choose a projection and click Continue
- Use the Back button if a change is required
- Enter a geographic position and click Continue to zoom to the position.
Zoom To Map Coordinates

Select the map projection of your coordinates.

Projection (Required)
- UTM
- Degrees, Minutes, Seconds
- Decimal Degrees

Continue Cancel

Zoom To Map Coordinates

Enter Coordinates in Degrees/Minutes/Seconds

--- Longitude
- Degrees (-84)
- Minutes (45)
- Seconds (0.00)

--- Latitude
- Degrees (49)
- Minutes (15)
- Seconds (0.00)

Continue Back Cancel
Search for Toronto Intersection

In the Toronto-view of COSINE, there is an additional button to Search for Toronto Intersections. This button opens the Toronto Intersection search panel on the left.

- Enter the name of a street and click Search for Intersection.
- The Intersection pull-down will be populated with intersections along the chosen street.
- Click the pull-down to select an intersection, and then click Zoom.
- The map interface zooms to the selected intersection. Proceed to select any stations as required, using the Map Selection tools.

Control Monument Selection

The Control Monument Selection tool is the core tool of COSINE Online that facilitates the querying of the COSINE database for geodetic control data based on map selections or text-based searches. Previously, text searches in COSINE were handled separately from the map interface. The map interface and the text-based search tools have been integrated in this new GeoCortex-based version of COSINE Online. The previous text search functionality has been moved into this tab.
For full details on the use of this tool go to the [Retrieving Control Survey Data](#) section of this guide.
Distance Tool and Printing

The **Measure Distance** tool allows users to measure linear and multi-point lines on the map, in the units selected using the **Units** pull-down.

The **Printing** tool allows users to print maps with details including Title, Inset Map, North Arrow, Scale Bar, Projection, Legend, Use Statements and Disclaimers.

**Measure Distance**

The **Measure** tool allows users to measure distance on the map in several units. Users can change the unit of measure at any time, but all distances measured will change accordingly.

Measure the distance of a line string:

- Select Measure Distance
- Click a starting location on the map
- Continue clicking as needed and double-click to finish
- If a user measures a distance and it includes more than two points, the distance between each pair as well as the total distance will display.

**Erase**

Erase any measurement mark-ups on the map by clicking Erase, the clicking the existing measured distance on the map. This erasure is permanent.

**Clear All**

Erase all measurement mark-up added to the map. A pop-up will appear to confirm all measurements will be deleted. Choose OK to proceed or Cancel to preserve measurement mark-up.

**Add as Drawing**
If checked the measure lines will remain as features on the map and be visible when the map is printed. When unchecked the features will not print.

Printing

Once the map is ready for printing, choose desired print options.

- Select Layout: Letter is the only currently available page size
- Choose an Output Format: PDF, JPG, or PNG
- Resolution is set at Standard (96 dpi)
- Choose Map Scale. Options range from 1:1,128 through 1:10,000,000, or choose Current Extent or Current Scale.
- Optional: provide a Title and / or Notes to be displayed on the map.
- Click the Print button to generate a file in the selected format.
Click ‘Open File’ to view the map. The map can now be viewed on screen, printed and / or saved as desired.

Scale indicates how many units on the earth’s surface are equal to one unit on the map. For example 1:100,000 means 1 cm on the printed map equals 100,000 centimetres or 1 kilometre on the earth’s surface. Choosing Current Extent will print your map in its current extent and scale.
Retrieving Control Survey Data

The Control Monument Selection tool is the core tool of COSINE Online that facilitates the querying of the COSINE database for geodetic control data based on map selections or text-based searches. The map interface and the text-based search tools are fully integrated in this new GeoCortex-based version of COSINE Online. (Previously, text searches in COSINE were handled separately from the map interface).

The sections of the Retrieval Tool are intended to be completed in sequence from top-down to build a query to search the COSINE database. The Text-Search / Add to Map Selection and Filter Criteria panels are optional and are used to add text-based queries in addition to any monuments that are selected on the map. Selecting the header of each section will expand or collapse the section.

You must always click the Search button at the bottom to submit your query to the database. Your results will be shown in a panel that will open below the map. If any settings are changed in the left panel, for example adding or removing a datum selection, you must click Search again to refresh the Results panel.
Map Selection

The Map Selection section contains three (3) tools for selecting control survey monuments on the map interface, plus a button to clear the selected monuments from the selection set. Use these tools to select survey monuments on the map and to add them to the selection set for querying. Note: You must zoom in on the map to display control monument (station) locations. You must also zoom in further in order for the COSINE name labels to display with the control monuments.

Use any of the following tools to select stations on the map and build a selection set. Stations will be added into the selection set using any of these tools until Clear Selection is selected. Stations that are included in the selection set are marked with a red circle on the map.

The Draw Circle tool allows the user to click and drag on the map to create a circle around the desired point. Survey monuments located within the circle will be added to the selection set.

The Draw Rectangle tool allows the user to click and drag on the map to create a rectangle which will select any survey monuments inside. They will be added to the selection set.

The Draw Polygon tool allows the user to draw the vertices of a multi-sided polygon on the map interface. Double-click to finish drawing the polygon – it will automatically close the polygon and select all survey monuments located within the defined polygon.

The Clear Selection tool removes all control stations from the selection set.
As survey monuments are selected using the Draw Circle, Rectangle, or Polygon tools, the station COSINE names are added to a selection set list, located below the selection tools.

By default, all stations added to the selection set have checkboxes that are enabled or “checked”. To remove certain stations from the selection set, simply un-check the corresponding boxes. Only “checked” stations will be carried forward through the remainder of the selection process.

Once you are satisfied with the list of selected stations, proceed to the Datum section.

**Datum**

This section provides a list of available horizontal and vertical datums.

Place a checkmark next to any and all datums you wish to retrieve. Not all stations have coordinates available related to all datums. The selected datum will be included in the report only if they exist for the selected stations. Likewise, if a selected station does not have a record in one of the selected datums, no report will be generated for the station. At least one horizontal datum is required to be selected. Vertical datum retrieval is optional.
### Horizontal Datum

<table>
<thead>
<tr>
<th>Datum Identifier</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAD-1983:CSRS:CBNV6-2010.0</td>
<td>NAD83 Canadian Spatial Reference System (CSRS) v6 – 2010.0 Epoch</td>
</tr>
</tbody>
</table>

### Vertical Datum

<table>
<thead>
<tr>
<th>Datum Identifier</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HT-1997</td>
<td>Height Transfer System 1.0 (1997)</td>
</tr>
<tr>
<td>HT-2001</td>
<td>Height Transfer System 2.0 (2001) – HTv2.0 hybrid geoid model based on an earlier geoid model (CGG2000) that has been distorted to fit with CGVD28 benchmarks published elevations.</td>
</tr>
</tbody>
</table>

### Values Preference

The City of Toronto have specified horizontal coordinates for control stations and elevations for benchmarks within the limits or boundaries of Toronto that are incorporated within COSINE using different datum-identifiers than those supplied by provincial and federal agencies. In some cases, a given station within the limits of the City of Toronto may have two different sets of horizontal coordinate values related to the NAD-1927 datum. In retrieval reports, the coordinate values from City of Toronto are denoted by the datum identifier “TOR_H-1974”. These sets of values may differ considerably from one another because of differing adjustment methodologies, etc.

Work is currently underway to incorporate a framework of GPS-derived horizontal control stations from the City of Toronto into the Ontario High Precision Network (OHPN) related to the NAD83-CSRS CBN v6 2010.0 Epoch datum realization. There will be one set of accurate coordinates for these horizontal control stations related to the NAD83-CSRS CBN v6 Epoch 2010.0 datum realization that will be identical and consistent whether accessed through the Ontario-wide or Toronto views available in COSINE. Users will continue to need to be aware of the differences in values for horizontal control...
and vertical benchmarks that will continue to impact other points within Toronto related to other (older) datums, such as NAD27.

There is a values preference option in COSINE to indicate whether Toronto values are to be retrieved. For retrievals performed in the “Toronto-View” COSINE application, the default is that Toronto-based values for horizontal data (TOR_H-1974) and elevation data will be given first in the retrieval report, although in the case of vertical data, you may also see elevations consistent with the Ontario-wide view that are in COSINE. When Toronto data is lacking, the Ontario-wide COSINE values will appear in the retrieval report. Please note that for retrievals performed in the “Ontario-wide” COSINE application, the default is for the Ontario-wide COSINE values to be preferred within the limits of the City of Toronto, even when Toronto-supplied values are available. For questions related to the quality of Toronto data in COSINE, please contact, Gabriel Bincik at gbincik@toronto.ca, or (416) 392-0415.

**Text Search / Add to Map Selection**

This section can be used in conjunction with or instead of selecting stations on the map interface, to specify your retrieval criteria by textual, rather than graphical means. The text-based search functions available in previous versions of the COSINE Online application in the “Primary” and “Secondary” buttons are now located in this section. Any stations selected through text queries in the **Text Search / Add to Map Selection** section are considered in addition to any station(s) already selected on the map in the selection set. Criteria entered into the input boxes in this section are understood to have the keyword “or” before each specification (meaning this is a union query in which stations meeting any of the criteria are returned – see below).

For example, entering Station Prefix “099” and Network Membership “2078” will retrieve all stations with a COSINE name prefix of 099, along with all stations that are members of network 2078, regardless of their prefixes. You may think of this as a “union” query. Stations matching either criterion will be returned.

If you instead were trying to retrieve only stations from network “2078” that have a prefix of “099”, you would instead enter “099” in the Station Prefix box on the **Text Search / Add to Map Selection** tab, and enter Network Membership “2078” on the **Filter Criteria** tab. You may think of this as an “intersect” query. Only stations matching both criterions will be returned.
**Station Names**

*Optional:* Enter COSINE stations name(s) to be retrieved. Any station names entered here will be in addition to any stations that may have been selected on the map. Note: There is no support for wildcards (* or %). You may use the Station Prefix option to search for partial names.

A list of stations can be retrieved, separated by blanks or separate lines. For example,

00819730029 00819730030 00819730031 00819730032
00819730040 00819730041 00819730042 00819730100

A range of station names can be chosen by enclosing the first and last names in round brackets. For example, the above list could have been written:

(00819730029 00819730032) (00819730040 00819730042) 00819730100
Station Prefix

Enter the prefixes of the COSINE names of the stations whose records you want to retrieve, separated by blanks. Use as many lines as you need. For example,

0011973 0011974 0011975

would request the records of all stations established in Ontario by the Canadian Geodetic Survey – NRCan (Natural Resources Canada) - agency code 001 in the years 1973, 1974, and 1975.

This can result in the retrieval of a large number of station records and should therefore be used with caution. You might find its use better confined to the Filter Criteria section when the primary criterion is based on geographic area. For example, if you wanted all the Federal stations within a specific area, you could define the geographic area on the Text Search / Add to Map Selection tab using a geographic rectangle, and then enter 001 in the Stations Prefix field on the Filter Criteria tab.

A range of station prefixes can be indicated by enclosing the first and last names, only, in round brackets. For example, the above list could have been written (0011973 0011975)

Geographic Rectangle, Polygon, or Circle

While the map interface is the ideal method for spatial queries, you may wish to perform a spatial search within the confines of a specific geographic boundary. To do so, you may enter coordinates in the Rectangle, Polygon, or Circle search fields using the formats described below.

Note that, in place of coordinates, if you know the name of a station that is to be a vertex or centre-point, you can enter *(station_name). Thus, you can enter *(00819730147) rather than the coordinates of station 00819730147 in the following.

Latitude and longitude may be entered in DD (decimal degrees), DM (degrees and decimal minutes), or DMS (degrees, minutes, seconds):

<table>
<thead>
<tr>
<th>Format</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ndd-mm-ss.s Wdd-mm-ss.s</td>
<td>N43-20-00.47869 W79-50-19.15738</td>
</tr>
<tr>
<td>Ndd-mm.m Wdd-mm.m</td>
<td>N43-20.00798 W79-50.31929</td>
</tr>
<tr>
<td>Ndd.d Wdd.d</td>
<td>N43.33347 W79.83865</td>
</tr>
</tbody>
</table>

UTM coordinates may be entered in the format:
zone(easting northing) i.e. 17(E594146.206 N4798501.562)
For clarity, you may prefix the UTM zone number with UTM or U:, for example UTM17 or U17. If you enter the easting before the northing, then the use of the E and N prefixes is unnecessary. You may enter the northing before the easting if you use the prefixes. Note that there must be no space between the zone number and then left parenthesis. Spaces elsewhere are optional, except that you must have at least one space between the easting and the northing.

If your coordinates are with respect to an MTM zone number, you must prefix the MTM zone number with MTM or M:, for example MTM10 or M10. If you have more than one UTM or MTM coordinate pair from the same projection zone, just enter them within the same list of coordinate pairs that immediately follows the zone specifier. An example is given below.

Select from the following methods to define the geographical area for your search, and fill in the appropriate input box or boxes. If you need to define more than one area of a given type (rectangle, polygon, or circle), use a semicolon (; ) to separate the first area specification from the second, etc. Note that you need a semicolon if and only if you have two or more complete areas to be specified: please do not use the semicolon within the specification of a single area.

**Geographic Rectangle**

To search for the records of all stations located within a “rectangular” area, you must specify two diagonally opposite points of the “rectangle”. For example:

```
N43-20  W79-50  N44-05  W79-38
```

specifies the area bounded on the south and north by the N43°20′ and N44°05′ parallels and on the east and west by the W79°38′ and W79°50′ meridians.

If your coordinates are UTM or MTM, you will have to enter something similar to

```
17(E533327 N4717303 E537928 N4714004)
```

to define a rectangle with UTM coordinates. An MTM-coordinates area would be specified in the same way, but with an MTM or M prefixed to the zone number.

**Geographic Polygon**

To search for the records of all stations located within an area bounded by a more general polygon defined by three or more vertices, simply enter the coordinates of each vertex in clockwise or counter-clockwise order, beginning with any vertex. For example:

```
N43-20  W79-50  N44-05  W79-38
N43-20  W79-38  N44-05  W79-50
```
specifies the same area as in the preceding example. Note that the final edge of the polygon need not be given.

**Geographic Circle**

To search for the records of all stations within a certain distance of a given point, specify the coordinates of the point followed by the distance in kilometres. For example:

\[
\text{N43-20-00.47869 W79-50-19.15738 10KM}
\]

specifies the circle of 10 kilometres radius centred about the point of latitude \(N43°20′00.47869″\) and longitude \(W79°50′19.15738″\)

A search criteria *(00119963021) 5KM would return all stations within 5 km of station 00119963021

**Network Membership**

Enter the name of a network to retrieve the stations that belong to that network. Most networks are four digit numbers, some with a ‘V’ suffix to signify a vertical network.

Example:

\[
2493 \ 2498 \ 3201V
\]

would select the records of the stations that are members of networks 2493, 2498, and 3201V.

The networks that a station is a member of are listed near the bottom of each station’s Standard Report. You can further filter to retrieve only the fixed or free stations in such networks by clicking the appropriate radio button under “Network Usage” on the Additional Filter Criteria tab.

**Filter Criteria**

The Filter Criteria panel allows filtering of query results, in conjunction with the Text Search / Add to Map Selection tab or with map selections. Criteria specified in the Filter Criteria panel are combined with criteria from the Text Search / Add to Map Selection panel or map selection in an “intersect” query fashion.

For example, a selection could first be specified using the map tools that selected all 285 stations in the North Bay area using the rectangle tool. If Station Prefix of ‘001’ was entered on the Filter Criteria tab, only North Bay area selected stations that also have a Station Name beginning with 001 would be carried forward in the database query. The selection set of 285 is filtered down to 155 stations that start with ‘001’.
Refer to the Text Search / Add to Map Selection section for specific details on the expected syntax, etc. for the text boxes.

**Additional Filter Criteria**

The Additional Filter Criteria section provides additional filtering options to narrow down your query, if desired. You can choose to filter by monument status (existing or destroyed), horizontal accuracy orders, vertical accuracy orders, and network usage.
Monument Status

To filter your retrieval request by the status of the monument, select one of the options listed by clicking on the radio button to the left of the option.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing or Destroyed/Unknown</td>
<td>Retrieves all selected stations, regardless of whether they exist or are destroyed. <em>(Default)</em></td>
</tr>
<tr>
<td>Existing Only</td>
<td>Retrieves only existing stations.</td>
</tr>
<tr>
<td>Destroyed/Unknown Only</td>
<td>Retrieves only destroyed stations or stations with unknown status.</td>
</tr>
</tbody>
</table>

Horizontal Order

Turning on any checkboxes here will limit your selection to stations that have accuracy orders meeting the selected orders. The default is to leave all options un-checked. This will return all stations, regardless of accuracy order.
Horizontal order are classes numbered first through fourth, depending on the provincial standard met by the respective adjustment in which the respective coordinates or elevations were calculated, with the first order having the highest level of precision attainable. There is also, for Toronto station based on NAD-1927 (1974 adjustment), a specific classification known as “Toronto third order”, for the exact meaning of this classification for a specific station you must refer to the contact person for Toronto data. NAD83-CSRS data is classified by Class A to D, with a Toronto-specific Class E.

**Note:** Many vertical control stations (benchmarks) have unclassified horizontal coordinates. These are provided only to facilitate map display and to locate the monument. Unclassified horizontal coordinates are approximate in nature and cannot be relied upon for control survey purposes.

**Vertical Order**

Turning on any checkboxes here will limit your selection to stations that have accuracy orders meeting the selected orders. The default is to leave all options un-checked. This will return all stations, regardless of accuracy order.

Vertical orders are classes numbered first through fourth, depending on the provincial standard met by the respective adjustment in which the respective coordinates or elevations were calculated, with first order having the highest level of precision attainable. There is also, for Toronto stations based on CGVD-1928, a specific classification known as “Toronto third order”. For the meaning of this classification for a specific station you must refer to the contact person for Toronto data.

**Note:** Many vertical control stations (benchmarks) have unclassified horizontal coordinates. Unclassified horizontal coordinates are approximate in nature and cannot be relied upon for control survey purposes.

**Network Usage**

The network usage criterion is meaningful only if you are doing a network-based retrieval. “Fixed” and “free” refer to the usage of the coordinates of the station in the least-squares adjustment for the network or networks specified in the network list criterion.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed or Free (default)</td>
<td>Retrieves all selected stations, regardless of network usage. <strong>(Default)</strong></td>
</tr>
<tr>
<td>Fixed Only</td>
<td>Retrieves only stations whose coordinates were held fixed in the network adjustment(s) to be returned.</td>
</tr>
<tr>
<td>Free Only</td>
<td>Retrieves only stations whose coordinates were made free in the network adjustment(s) to be returned.</td>
</tr>
</tbody>
</table>
Once you have selected the desired stations on the map, or defined search criteria in the Text Search / Add to Map Selection section, and chosen the required Datums, and added any optional filtering criteria in the Filter Criteria or Additional Filter Criteria panels, the final step is so click Search to submit your query to the COSINE database. The results will show in a panel that will open below the map.
Results & Reports

When the Search button is selected, the results are displayed in a panel that opens below the map.

The next step is to choose the report type to be generated. Then select the station(s) from the list to be included in the report either by holding the Shift key and clicking the first and last stations, or by clicking and dragging on the list, or Ctrl+A will select all items in the list. Finally, click View Report.

The report panel can be expanded by dragging the divider between the results panel and the map, or by clicking the up arrow located in the upper-right corner of the results panel.

As each station in the results list is selected, the station is highlighted on the map and the map interface pans to the location.

Reports

The types of available reports are listed across the top of the Results panel as radio buttons. The Short-form and Full-form Reports are available in two versions: Detailed and Station.

- **Detailed Version** includes all details about the station such as text description and maintenance notes.
- **Station Version** focuses on the coordinates and elevations and is better suited for reports that include a large number of stations.
To the right of the Detailed and Station Version radio buttons, there are two check boxes: 1. Show Grid Coords, and 2. Show/Use Vert Data. **Show Grid Coords** toggles whether to compute and display UTM and MTM coordinates in the report, and **Show/Use Vert Data** toggles whether to include Vertical Datum data on reports.

### Report Formats

<table>
<thead>
<tr>
<th>Report Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Report</td>
<td>Easy-to-read HTML table report <em>(default)</em></td>
</tr>
<tr>
<td>Short-form, Detailed</td>
<td>Portrait orientation, full details about each station</td>
</tr>
<tr>
<td>Short-form, Station</td>
<td>Portrait orientation, excludes some details like text description, maintenance</td>
</tr>
<tr>
<td>Full-Form, Detailed</td>
<td>Landscape orientation, full details about each station</td>
</tr>
<tr>
<td>Full-Form, Station</td>
<td>Landscape orientation, excludes some details like text description</td>
</tr>
<tr>
<td>Input for GeoLab®</td>
<td>Creates a .APX format file for use with GeoLab® software</td>
</tr>
<tr>
<td>XML Output</td>
<td>Creates a XML format text file for integrating with other software</td>
</tr>
<tr>
<td>Reference Sketch</td>
<td>Displays scanned reference sketches, if available. After report generation, click the Save button to export the images in a ZIP-file format.</td>
</tr>
</tbody>
</table>

### Report Options

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Show Grid Coords</td>
<td>Toggle whether to compute and display UTM and MTM coordinates for selected stations, along with geographic coordinates</td>
</tr>
<tr>
<td>Show/Use Vert Data</td>
<td>Toggle whether to include or exclude Vertical Datum data on reports.</td>
</tr>
</tbody>
</table>

### Standard Report

<table>
<thead>
<tr>
<th>Station: 00119963022</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Also known as:</td>
<td>001963022, 963022, CBM963022, MORY</td>
</tr>
<tr>
<td>Monument status:</td>
<td>Existing</td>
</tr>
<tr>
<td>Monument type:</td>
<td>Cpillar</td>
</tr>
<tr>
<td>Station type:</td>
<td>GPS</td>
</tr>
<tr>
<td>Horizontal datum:</td>
<td>NAD-1983:CSRS:CBNV6-2010.0</td>
</tr>
<tr>
<td>Horizontal accuracy:</td>
<td>CSRS Class A</td>
</tr>
<tr>
<td>Latitude:</td>
<td>N44°13'28.37117&quot;</td>
</tr>
<tr>
<td>Longitude:</td>
<td>W78°23'45.98254&quot;</td>
</tr>
<tr>
<td>Ellipsoidal elevation:</td>
<td>165.664</td>
</tr>
<tr>
<td>Ellipsoidal elevation order:</td>
<td>Second order</td>
</tr>
<tr>
<td>UTM-17 Easting:</td>
<td>E707977.945</td>
</tr>
</tbody>
</table>
The **Standard Report** format retrieves station data into an HTML table layout. If multiple stations were selected in the Results list, the reports will appear one after the other in the display panel, sorted by COSINE station name. **New in this version of COSINE:** there is a **horizontal datum section** with geographic coordinates, ellipsoid elevation, and projected UTM & MTM coordinates for each horizontal datum that had a checkmark in the query. If (a) vertical datum(s) was selected as well, it will appear below the horizontal datum information. A textual description of the station is provided below the datum information, along with any maintenance or other notes, where available.

If an elevation or coordinate has an accuracy order of “Unclassified”, the value will be truncated and contain “X” characters to denote the approximate nature of the elevation or coordinate.

---

**Save**

Station Reports can be saved by clicking the **Save** button. Standard Report format is saved as an HTML format file. The Short- and Full-Form reports are saved as ASCII text.

**Print**

Click the **Print** button to open the selected report(s) in a print-friendly new browser tab and then automatically open the Print function of your browser. You may need to enable pop-ups in your browser.

**Close**

To close the report and return to the Results panel, simply click the **Close** button on the report.

**Short- and Full-form Reports**

This report type generates the traditional or legacy ASCII text format COSINE output, designed primarily for print-out or text-file manipulation and is well suited to retrievals of a relatively large number of stations. The difference between Short- and Full-form is the page width. Short-form is intended for portrait orientation, and Full-form is intended for landscape orientation.

There are two subtypes of these reports:
Station Report

The station report is a concise version which focuses on coordinates and elevations, and excludes text records like description and maintenance.

Short-form Station Report

COSINE ONLINE RETRIEVAL (ONTARIO-WIDE)
SHORT - FORM FORMAT, STATION REPORT(2015/09/22 11:56:38)
# IN REPORT: 000002

ELLIPSOIDAL(SPHEROIDAL) DATUM: NAD-1983:ORIG

<table>
<thead>
<tr>
<th>01019865010</th>
<th>status: Existing</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAD-1927:SCAL</td>
<td></td>
</tr>
<tr>
<td>N44-17-40.0xxxx</td>
<td>W78-21-00.0xxxx</td>
</tr>
<tr>
<td>UTM-17</td>
<td>E711415.xxx</td>
</tr>
<tr>
<td>MTM-10</td>
<td>E396573.xxx</td>
</tr>
<tr>
<td>CGVD-1928:1978</td>
<td></td>
</tr>
<tr>
<td>o-elev: 210.035</td>
<td>m.defl: --</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>09919940034</th>
<th>status: Existing</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAD-1983:ORIG</td>
<td></td>
</tr>
<tr>
<td>N44-17-47.59733</td>
<td>W78-20-27.74611</td>
</tr>
<tr>
<td>UTM-17</td>
<td>E712116.990</td>
</tr>
<tr>
<td>MTM-10</td>
<td>E397382.385</td>
</tr>
<tr>
<td>CGVD-1928:1978</td>
<td></td>
</tr>
<tr>
<td>o-elev: 213.xxx</td>
<td>m.defl: 4.2</td>
</tr>
</tbody>
</table>

Full-form Station Report

COSINE ONLINE RETRIEVAL (ONTARIO-WIDE) FULL - FORM FORMAT, STATION REPORT(2015/09/22 11:57:58)
# IN REPORT: 000002

ELLIPSOIDAL(SPHEROIDAL) DATUM: NAD-1983:ORIG

<table>
<thead>
<tr>
<th>01019865010</th>
<th>NAD-1927:SCAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>N44-17-40.0xxxx</td>
<td>W78-21-00.0xxxx</td>
</tr>
<tr>
<td>UTM-17</td>
<td>E711415.xxx</td>
</tr>
<tr>
<td>MTM-10</td>
<td>E396573.xxx</td>
</tr>
<tr>
<td>CGVD-1928:1978</td>
<td></td>
</tr>
<tr>
<td>o-elev: 210.035</td>
<td>m.defl: --</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>09919940034</th>
<th>NAD-1983:ORIG</th>
</tr>
</thead>
<tbody>
<tr>
<td>N44-17-47.59733</td>
<td>W78-20-27.74611</td>
</tr>
<tr>
<td>UTM-17</td>
<td>E712116.990</td>
</tr>
<tr>
<td>MTM-10</td>
<td>E397382.385</td>
</tr>
<tr>
<td>CGVD-1928:1978</td>
<td></td>
</tr>
<tr>
<td>o-elev: 213.xxx</td>
<td>m.defl: 4.2</td>
</tr>
</tbody>
</table>
Detailed Report

The detailed report includes all details about the stations including text location description and maintenance notes, other known names for stations, etc.

Short-form Detailed Report

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td># IN REPORT:</td>
<td>000001</td>
</tr>
</tbody>
</table>

ELLIPSODAL(SPHEROIDAL) DATUM: NAD-1983:ORIG

-------------------------------
* 010196605010 * status: Existing monument type: -
-------------------------------

Ellipsoidal:
NAD-1927:SCAL

<table>
<thead>
<tr>
<th>UTM-17</th>
<th>E711415.xxx</th>
<th>N4907776.xxx</th>
<th>c.s.f.: 1.000014971 m.cmvg: 1-51-04.7</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTM-10</td>
<td>E396573.xxx</td>
<td>N4906475.xxx</td>
<td>c.s.f.: 1.00000354 m.cmvg: 0-48-11.4</td>
</tr>
</tbody>
</table>

Geoidal:
CGVD-1928:1978

o-elev: 216.035 m.defl: -- pv.defl: -- undul: -- order: 3

Text and misc. info:
Description: 5 FT RIB WITH B.C., FLUSH WITH GRADE. IN GRASSY AREA NORTH SIDE OF INTERSECTION OF SHERBROOKE ST AND WHITEFIELD DR. ON THE PRODUCTION OF THE C/L OF THE WHITEFIELD DR. AND 12.2 M N OF C/L OF SHERBROOKE ST.

Misc. info:
Networks: 0150V [FREE]

Full-form Detailed Report

<table>
<thead>
<tr>
<th>COSINE ONLINE RETRIEVAL (ONTARIO-WIDE)</th>
<th>FULL - FORM FORMAT, DETAILED REPORT(2015/09/22 11:57:20)</th>
</tr>
</thead>
<tbody>
<tr>
<td># IN REPORT:</td>
<td>000002</td>
</tr>
</tbody>
</table>

ELLIPSODAL(SPHEROIDAL) DATUM: NAD-1983:ORIG

-------------------------------
* 010196605010 * status: Existing monument type: -
-------------------------------

Ellipsoidal: NAD-1927:SCAL

<table>
<thead>
<tr>
<th>UTM-17</th>
<th>E711415.xxx</th>
<th>N4907776.xxx</th>
<th>c.s.f.: 1.000014971 m.cmvg: 1-51-04.7</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTM-10</td>
<td>E396573.xxx</td>
<td>N4906475.xxx</td>
<td>c.s.f.: 1.00000354 m.cmvg: 0-48-11.4</td>
</tr>
</tbody>
</table>

Geoidal: CGVD-1928:1978

o-elev: 216.035 m.defl: -- pv.defl: -- undul: -- order: 3

Text and misc. info:
Description: 5 FT RIB WITH B.C., FLUSH WITH GRADE. IN GRASSY AREA NORTH SIDE OF INTERSECTION OF SHERBROOKE ST AND WHITEFIELD DR. ON THE PRODUCTION OF THE C/L OF THE WHITEFIELD DR. AND 12.2 M N OF C/L OF SHERBROOKE ST.

Misc. info:
Networks [usage]: 0150V [FREE]

-------------------------------
* 09919640034 * status: Existing monument type: CAP
-------------------------------

Type: GPS
Input for GeoLab® format

The type of report produces an .APX format file to use with GeoLab® least-squares adjustment software. It produces a list of coordinates in the selected horizontal datum, with either ellipsoidal heights or orthometric elevations, based on whether a vertical datum was selected.

**Note:** This output format allows for only 1 horizontal datum selection.

Special consideration must be paid to the fixed-free flags in each row to determine whether the coordinates retrieved are in the datum requested. For example, if NAD83:ORIG is the selected datum but one of the selected stations only has NAD27 coordinates, the NAD27 coordinates would be included in the report, but the fixed-free flag would be set to “00x”. Please refer to the header text included in the GeoLab® output report for full details on the fixed-free flag meanings.

To retrieve ellipsoidal heights, the Vertical Datum selection on the Datum tab must either be set to “Do not retrieve vertical data” or have no vertical datums selected. A file with “PLH” records will be generated using ellipsoidal heights. “PLO” records indicate orthometric elevations.
XML Output format

This report type produces an XML file that can be used for database loading or other analysis. The markup consists of specially-delimited tags to group character data into a hierarchical structure which could be usable for database work and for formatting custom reports.

```xml
<?xml version='1.0'?>
<!-ELLIPOSIDAL(SPHEROIDAL) DATUM: NAD-1983:ORIG-->
<!-- # sta recds in output: 000004-->
<cosine-stations lang='en-CA' xml:lang='en-CA'>
<station id='15582' status='Existing' Monument-type='-' station-type='FRTR'>
  <name stamped-on-monument='unknown' Remarks='COSINE name 2001/12/20'>
    <AKA stamped-on-monument='unknown' Remarks='COSINE name 2001/12/20'>00119723121</AKA>
    <AKA stamped-on-monument='unknown' Remarks='Renamed 2000/02/16 15:43:14'>001723121</AKA>
    <AKA stamped-on-monument='unknown' Remarks='From COSINE XDB file'>G.S. KINGSTON USLS</AKA>
  </name>
  <ellipsoidal-data datum='NAD-1983:ORIG' order='1'>
    <Lat>N44-13-47.58512</Lat>
    <Lon>W76-29-17.28473</Lon>
    <ellipsoidal-elev order='-'-'>88.xxx</ellipsoidal-elev>
    <utm zone='18'>
      <e>E381151.380</e>
      <n>N4898482.867</n>
      <mc>-1-02-17.4</mc>
      <csf>0.99975988</csf>
    </utm>
    <mtm zone='9'>
      <e>E385747.897</e>
      <n>N4898876.027</n>
      <mc>0-00-29.8</mc>
      <csf>0.99988617</csf>
    </mtm>
  </ellipsoidal-data>
  <geoidal-data datum='CGVD-1928:1978' order='-'-'>
    <orthometric-elev>122.xxx</orthometric-elev>
    <mdef>1.9</mdef>
    <pvdef>4.8</pvdef>
    <undulation></undulation>
  </geoidal-data>
  <tower-text>
    <l>30M TOWER USED TO SIGHT</l>
  </tower-text>
</station>
</cosine-stations>
```
Reference Sketch format

The reference sketch format report retrieves digital scanned reference sketches for the stations in the query. Sketches are shown in the report panel for quick viewing. If a sketch does not exist for a given station, a note to that effect is generated.

Save Reference Sketches

Reference sketches can be saved by clicking the Save button within the Reports panel. This will generate a .ZIP compressed file containing the reference sketches in .GIF or .PDF format, based on the format of the original scan.
Appendix A
Frequently Asked Questions

1. How do I turn on Station Name labels?
Labels on Station Names will turn on automatically once zoomed into the map at a large scale.

2. Why do some control monuments appear to have two labels on the map?
You may notice some labels are horizontal on the map, while others are on a slant. The horizontal labels correspond to horizontal control monuments, while slanted labels correspond to orthometric elevations on a monument.

If both the horizontal and vertical layers are turned on at the same time, stations that have both a geodetic horizontal control coordinate as well as an orthometric elevation will appear to have two labels.

In the above image, station 01019860014 shows a triangle (horizontal coordinate) on top of a square (orthometric elevation) because both the horizontal and vertical layers are turned on at the same time (this is the default). Stations 00819760344 and 09920000086 show a yellow circle with a black triangle inside, representing a NAD83:CSRS Class D station with additional horizontal datums available, on top of a square (barely visible) representing an orthometric elevation. By comparison, station 09920040021 only has one label because there is no precise vertical data related to this control station.

3. For a given station, how can I find out whether there are coordinates or elevations available with respect to some other horizontal or vertical datum that I didn’t select for my report?
If you’ve selected the COSINE Standard Report format, look in the report for the entry Other horiz data or Other vert data for a list of datum realizations to which the given station has coordinates or elevations, respectively. Each datum name appears in bold.

Note: In this version of COSINE Online, you can select multiple horizontal and vertical datums to be included in your report, though this can make reports quite lengthy. Note: Only one horizontal datum selection is permitted for GeoLab® format output.

4. How are the station orders and classes, and hence the respective colours and shapes of the icons for those stations, determined on the map?

Every station that has a classified horizontal component will be included in the horizontal layer, and every station that has a classified vertical component will be included in the vertical layer. This means that if a station has, for example, a 2nd order NAD83-ORIG coordinate and a 1st order CGVD28 elevation, the map would show a red square (representing 1st order vertical) overlain by a blue triangle (representing 2nd order horizontal), if both the horizontal and vertical layers were turned on.

The colour of a symbol is determined by the highest accuracy order. If a station had a 3rd order NAD27 coordinate and a 2nd order NAD83-ORIG coordinate, the station would be shown as a blue triangle, representing 2nd order horizontal.

For NAD83-CSRS stations, a new symbology class is introduced in this version of COSINE: CSRS with Other Horizontal. These symbols are shown when a station has a NAD83-CSRS coordinate (either v3-1997 or v6-2010) as well as another horizontal datum, such as NAD83-ORIG. These symbols show the circle, coloured by the accuracy classification of the NAD83-CSRS component, along with a black inset triangle meaning that other horizontal datums are present. For example, a station that has Class D NAD83-CSRS v6-2010 coordinates as well as 2nd order NAD83-ORIG coordinates, would be shown on the map as a yellow circle (representing Class D NAD83-CSRS) with an inset black triangle.

See Appendix B for more details on legend symbology.

5. I want to get a listing of other stations located within a certain distance of a given station. Is there an easy way to do that?

There are two ways to do this:

- Click Search For/Zoom To tab and open the Control Monument Selection tool.
• On the **Map Selection** tab, click the **Draw Circle** tool, click on the map and drag a circle of the desired size to select all stations within.

**OR**

• Within the **Control Monument Selection** tool, go to the **Text Search / Add to Map Selection** tab

• In the text box labelled **Geographical Circle** enter *(stationName) ##KM*, replacing `stationName` with the name of the station you want to buffer, and `##` with the desired search distance in kilometres.

For example, *(00119963022) 2KM* will select stations within 2 km of station 00119963022.

### 6. I need to retrieve all control station data in an area that is bounded by a pair of northings and eastings in MTM zone 10. How can I get COSINE to find what I need?

• Click the **Search For/Zoom To** tab, then click the **Control Monument Selection** tool.

• On the **Text Search / Add to Map Selection** tab, go to the text-entry field labelled **Geographical Rectangle**.

• Type in **MTM10** (Note that there is no space between the zone-specifier and the left round bracket).

• Type in one of your northing limits and one of your easting limits, using one or more spaces to separate them. You can enter them in either order, provided that you use the N and E prefixes to indicate the order (the default is easting first, then northing).

• Type in the other pair of limits, again using the appropriate N and E prefixes.

• Finally, close the list with a right round bracket.

• Choose the desired datum(s) in the **Datum** tab.

• Then scroll to the bottom of the left panel and click **Search**.

**Example:** `MTM10 ( N5016300 E209176 N5016900 E210104 )`

For UTM, use UTM in place of MTM. Pairs of latitude and longitude can also be used, type in the coordinates in the order: latitude1, space, longitude1, space, latitude2, space, longitude2, with no enclosing brackets. Decimal degrees can be specified, or DMS in the form ddd-mm-s.ssss.

### 7. How do I get ellipsoidal heights included in PLH records in the GeoLab® output format?

Either the option “Do not retrieve vertical data” must be selected in the Datum tab, or no vertical datums can be checked **ON** in order for ellipsoidal heights to be included in the PLH records in GeoLab® format. Also, you must have only 1 horizontal datum selected for this report type.

### 8. Where does the base map information come from?
The base map, shown under the COSINE data layers, shows the following Ontario government data:

- Administrative Boundaries - Provincial boundaries, municipalities, townships, lots and concessions, provincial parks, conservation reserves, national parks, Indian reserves and other federal lands.
- Airports
- Bridges and Tunnels
- Buildings
- Dams
- Elevation - Contours, spot heights and hill shading.
- Falls, Rapids and Rocks
- Lakes and Rivers
- Place Names
- Pipelines
- Railways
- Roads
- Imagery
- Trails
- Transmission Lines
- Wetlands
- Wooded Areas

9. Where do the names of lakes, rivers, islands, cities and other features come from?

This map features the official names approved by the Minister of Natural Resources and Forestry. You may see alternate names appear in brackets for some places and geographic features.

10. Can I save and print my map?

Select the Printing tab to save and print your map. There are also tools that let you customize your map. Refer to Markup and Printing for further information on how to create a map.

11. How do I report an error or missing data?

We want your feedback. Please email the monument name and any supporting photos, reports, or screen capture of the missing data, coordinates or other possible error to geodesy@ontario.ca. Submissions will be reviewed and given due consideration.

12. Why do I see white space in the map?

When you zoom in beyond each map layer’s limit it may disappear (leaving white space in the map view) due to a variety of factors:

- LIO Topographic Data Cache has accuracy restrictions limiting how far you can zoom in
- Ontario Imagery resolution varies across the province
- Assessment parcel data does not exist for all of Ontario

13. What browsers are supported by COSINE Online?

- Internet Explorer 9+
- Firefox 30+
- Chrome 36+
14. What accessibility features are available for COSINE Online?

COSINE Online Service uses the Latitude Geographics Geocortex Viewer HTML5 2.4.x which adheres to Web Content Accessibility Guidelines (WCAG) 2.0. There are two aspects to accessibility support in COSINE Online:

**Screen Readers**

Screen readers read the application text aloud, so the user can listen to the page instead of seeing it. The text is read aloud where the mouse pointer is positioned. The application can be navigated by using a mouse, the keyboard, a sip-and-puff device, or any other type of navigation device. There are three pieces of information that are provided about the map:

- The coordinates at the center of the current map extent.
- The current scale of the map. The scale is only provided when the zoom level changes.
- The number of visible features of each visible layer.

To make the screen reader read out information about the map without changing the map extent, select the map with either the mouse or the TAB key.

**Keyboard Shortcuts**

Keyboard shortcuts allow interaction with COSINE Online using a keyboard instead of a mouse. The active command is highlighted with a red border. Keyboard shortcuts provide a level of precision that a mouse does not. You can move or resize a shape by a single pixel using the keyboard. At this time, Freehand Draw and Multi-point Identify Operations cannot be controlled using the keyboard.

HTML 5 standard keyboard shortcuts to navigate the page and select or activate items are:

<table>
<thead>
<tr>
<th>To do this...</th>
<th>Press...</th>
</tr>
</thead>
</table>
| Navigate forward through the page’s components | TAB  
   Note: In Chrome, you cannot tab between individual items. You must tab to the group, and then use the arrow keys to change the selection. |
| Navigate backward through the page's components | SHIFT + TAB |
| Select or activate the current UI component | ENTER |
| Select checkbox                      | SPACE BAR                                      |
| Pan the map (if selected)            | Arrow keys                                     |
**HTML5 COSINE Online Application Keyboard Shortcuts**

The application uses shortcuts for working with shapes, including text markup. These shortcuts are used with tools that require the user to manipulate a shape on the map, specifically, identify, draw, measure and edit tools are:

<table>
<thead>
<tr>
<th>To do this...</th>
<th>Press...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Move slider</td>
<td>Arrow keys</td>
</tr>
<tr>
<td>Jump slider</td>
<td>PAGE UP; PAGE DOWN</td>
</tr>
<tr>
<td>Jump slider to the start or end</td>
<td>HOME; END</td>
</tr>
<tr>
<td>Add a vertex to the shape that you are creating</td>
<td>ENTER</td>
</tr>
<tr>
<td>Move vertex horizontally or vertically</td>
<td>Arrow keys</td>
</tr>
<tr>
<td>Move vertex diagonally</td>
<td>PAGE UP; PAGE DOWN; HOME; END</td>
</tr>
<tr>
<td>Move the selected shape horizontally or vertically</td>
<td>Arrow keys</td>
</tr>
<tr>
<td>Move the selected shape diagonally</td>
<td>PAGE UP; PAGE DOWN; HOME; END</td>
</tr>
<tr>
<td>Enlarge the selected shape uniformly</td>
<td>S</td>
</tr>
<tr>
<td>Reduce the selected shape uniformly</td>
<td>SHIFT + S</td>
</tr>
<tr>
<td>Rotate the selected shape to the right</td>
<td>R</td>
</tr>
<tr>
<td>Rotate the selected shape to the left</td>
<td>SHIFT + R</td>
</tr>
<tr>
<td>Complete the shape</td>
<td>ENTER, ENTER (press ENTER twice)</td>
</tr>
<tr>
<td>Enter vertex editing mode</td>
<td>V</td>
</tr>
<tr>
<td>Select the next vertex of the current shape (in vertex editing mode)</td>
<td>V</td>
</tr>
<tr>
<td>Select the previous vertex of the current shape (in vertex editing mode)</td>
<td>SHIFT + V</td>
</tr>
<tr>
<td>Delete vertex</td>
<td>D</td>
</tr>
<tr>
<td>Exit vertex editing mode</td>
<td>ENTER</td>
</tr>
</tbody>
</table>
For greater precision when moving, rotating or resizing a shape, hold down the ALT key while pressing the desired shortcut keys. For example, press ALT + LEFT ARROW to move the selected shape one pixel to the left.

**Use the Keyboard to Measure Distance**

- Press TAB as many times as needed to navigate to the *Measure* tool.
- Press ENTER to open the *Measure* tool. The pointer is positioned on the Measure Distance tool.
- Press ENTER to activate the *Measure Distance* tool.
- Press ENTER to create the first vertex. Because you are drawing a line, the vertex is an endpoint.
- Use the arrow keys and diagonal movement keys to move the endpoint close to the desired position.
- Use the ALT key in combination with any other movement keys to move the endpoint to the precise position that you want. The ALT key restricts the movement to one pixel each key press.
- Press ENTER to mark the position of the first endpoint and create the other endpoint.
- Move the endpoint to the desired position.
- Press ENTER twice to mark the position of the second endpoint. This completes the measurement.

**Use the Keyboard to Draw a Polygon**

- Press TAB as many times as needed to navigate to *Markup*.
- Press ENTER to open *Markup*.
- Press TAB as many times as needed to navigate to the *Polygon* tool.
- Press ENTER to activate the *Polygon* tool.
- Press ENTER to create the first vertex.
- Use the arrow keys and diagonal movement keys to move the vertex close to the desired position.
- Use the ALT key in combination with any other movement keys to move the vertex to the precise position that you want. The ALT key restricts the movement to one pixel each key press.
- Press ENTER to mark the position of the first vertex and create the next vertex.
- Move the vertex to the desired position. Continue adding and positioning vertices until there are no more vertices to add.
- Press ENTER twice to close the polygon.

Source: Geocortex Viewer for HTML 5 2.4.x: Administrator and Developer Guide.  **Copyright © 2015 Latitude Geographics Group Ltd.**
Appendix B
Legend Description

**Horizontal Stations**
- ▲ First Order
- ▲ Second Order
- ▲ Third Order
- ▲ Fourth Order
- ▲ Toronto Third Order

The **Horizontal Stations** layer displays points as triangles for the datums NAD27:1974, NAD27:1976, and NAD83:ORIG. The triangles are coloured based on their accuracy order: red representing First Order, blue representing Second Order, green representing Third order, yellow representing Fourth order, and brown representing Toronto Third Order. This layer is turned **on by default**. If a station contains a classified coordinate in one of these datums, a triangle will be displayed on the map with a label oriented horizontally.

**Vertical Stations**
- □ First Order
- □ Second Order
- □ Third Order
- □ Fourth Order
- □ Toronto Vertical Third Order

The **Vertical Stations** layer displays points as squares for the datums CGVD:Pre-1978, CGVD28:1978, CGVD2013, HT-1997, and HT-2001. The squares are coloured based on their accuracy order: red representing First Order, blue representing Second Order, green representing Third order, yellow representing Fourth order, and brown representing Toronto Third Order. This layer is turned **on by default**. If a station contains a classified coordinate in one of these datums, a square will be displayed on the map with a slanted label.

**Note:** If a given station has both a classified horizontal coordinate and a classified vertical elevation, the station will show on the map as a triangle overlapping a square.

**Unknown or Missing Stations**
- + Destroyed/Unknown Stations
The **Unknown or Missing Stations** layer shows stations with destroyed status. This layer is **off by default** and should only be turned on when troubleshooting a monument found in the field or when specifically looking for destroyed monuments. It is recommended that this layer is used with other layers turned off to avoid a confusing map view.

**NAD83-CSRS Stations**
- Class A
- Class B
- Class C
- Class D
- Class E
- Class A with Other Horizontal
- Class B with Other Horizontal
- Class C with Other Horizontal
- Class D with Other Horizontal
- Class E with Other Horizontal

Stations with a NAD83-CSRS coordinate are identified with a circle coloured according to the accuracy classification assigned to it. There are currently 2 realizations of NAD83-CSRS: CBNv3 (1997.0) and CBNv6 (2010.0). If the classification of a station differs between the two realizations, the circle is coloured by the higher classification. Class A (mainly CBN pillars) is represented by a red circle, Class B (mainly Ontario High Precisions Network stations with direct ties to the CBN) is represented by a blue circle, Class C is represented by a green circle, Class D is represented by a yellow circle, and a Toronto-specific Class E is represented by a brown circle.

If a station has classified coordinates in NAD-CSRS as well as another horizontal datum (i.e. NAD83:ORIG), the station is symbolized by a circle coloured by the assigned NAD83-CSRS class, but with a black triangle overlain. These are identified in the legend as **Class _ with Other Horizontal**.

**RTK Providers**
- ★ Leica SmartNet Stations
- ★ Cansel Can-Net Stations
- ★ Topcon TopNET Live Stations
The base-stations that comprise the private-sector/commercial RTK provider networks are symbolized as stars, identifying RTK base stations that are part of the provider’s networks. Leica SmartNet stations are shown in red, Cansel Can-Net stations are shown in yellow, and Topcon TopNET stations are shown in blue. For more information regarding any of the individual private-sector/commercial RTK networks, please contact the vendor directly.
Appendix C
COSINE Agency Codes

The following table shows assigned COSINE agency codes. These codes are the first 3 digits of COSINE Station Name identifiers. Contact Parcel Mapping and Georeferencing for more information or send an email to geodesy@ontario.ca.

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Description</th>
<th>Prefix</th>
<th>Description</th>
<th>Prefix</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>001</td>
<td>NRCan – Geodetic Survey of Canada</td>
<td>029</td>
<td>Waterloo, Regional Municipality of</td>
<td>055</td>
<td>Welland, City of</td>
</tr>
<tr>
<td>002</td>
<td>DND – Mapping and Charting Establishment</td>
<td>030</td>
<td>Waterloo, City of</td>
<td>056</td>
<td>Woodstock, City of</td>
</tr>
<tr>
<td>003</td>
<td>Canadian Hydrographic Service</td>
<td>031</td>
<td>Barrie, City of</td>
<td>057</td>
<td>Midland</td>
</tr>
<tr>
<td>004</td>
<td>Dept of Environment – Water Planning &amp; Operations – Engineering Division</td>
<td>032</td>
<td>Brantford, City of</td>
<td>058</td>
<td>Cornwall, City of</td>
</tr>
<tr>
<td>005</td>
<td>Min. of Transportation – Engineering and Architectural Branch</td>
<td>033</td>
<td>Chatham, City of</td>
<td>059</td>
<td>Cochrane, Town of</td>
</tr>
<tr>
<td>006</td>
<td>Public Works – Property Services Directorate</td>
<td>034</td>
<td>Cambridge, City of</td>
<td>060</td>
<td>Canadian National Railway</td>
</tr>
<tr>
<td>007</td>
<td>Public Works – Engineering Design Directorate</td>
<td>035</td>
<td>Guelph, City of</td>
<td>061</td>
<td>Canadian Pacific Railway</td>
</tr>
<tr>
<td>008</td>
<td>MTO – Land Surveys</td>
<td>036</td>
<td>Niagara Falls, City of</td>
<td>062</td>
<td>Bell Telephone Company</td>
</tr>
<tr>
<td>009</td>
<td>MTO – Engineering Surveys</td>
<td>037</td>
<td>North Bay, City of</td>
<td>063</td>
<td>International Nickel Company (INCO)</td>
</tr>
<tr>
<td>010</td>
<td>Min. Natural Resources</td>
<td>038</td>
<td>St. Catharines, City of</td>
<td>064</td>
<td>Ottawa/Carleton, Regional Municipality of</td>
</tr>
<tr>
<td>012</td>
<td>Min. of Housing</td>
<td>039</td>
<td>Sarnia, City of</td>
<td>065</td>
<td>Orillia, City of</td>
</tr>
<tr>
<td>013</td>
<td>Min. Government Services</td>
<td>040</td>
<td>Windsor, City of</td>
<td>066</td>
<td>Tilbury, Town of</td>
</tr>
<tr>
<td>015</td>
<td>Min. Consumer Relations – Property Rights Division</td>
<td>041</td>
<td>Sault Ste. Marie, City of</td>
<td>067</td>
<td>Keewatin, Town of</td>
</tr>
<tr>
<td>016</td>
<td>Min. Treasury and Economics</td>
<td>042</td>
<td>Brampton, City of</td>
<td>068</td>
<td>Kirkland Lake, Town of</td>
</tr>
<tr>
<td>017</td>
<td>Min. Environment</td>
<td>043</td>
<td>Burlington, City of</td>
<td>069</td>
<td>Thunder Bay, City of</td>
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<tr>
<td>018</td>
<td>Ontario Hydro</td>
<td>044</td>
<td>Kenora, Town of</td>
<td>070</td>
<td>Opasatika, Improvement District of</td>
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<tr>
<td>019</td>
<td>National Capital Commission</td>
<td>045</td>
<td>Oakville, Town of</td>
<td>071</td>
<td>Oshawa, City of</td>
</tr>
<tr>
<td>020</td>
<td>City of Toronto (1975+) / Metro Toronto – Dept of Roads (Pre-1975)</td>
<td>046</td>
<td>Fort Erie, Town of</td>
<td>072</td>
<td>Simcoe, Town of</td>
</tr>
<tr>
<td>021</td>
<td>Metro Toronto – Dept of Works (Prior to 1975)</td>
<td>047</td>
<td>Port Colborne, City of</td>
<td>073</td>
<td>Timmins, City of</td>
</tr>
<tr>
<td>022</td>
<td>Metro Toronto – Toronto, City of (Prior to 1975)</td>
<td>048</td>
<td>Leamington, Town of</td>
<td>074</td>
<td>Peel, Regional Municipality of</td>
</tr>
<tr>
<td>023</td>
<td>Metro Toronto – North York, City of (Prior to 1975)</td>
<td>049</td>
<td>Ridgetown, Town of</td>
<td>075</td>
<td>Mississauga, City of</td>
</tr>
<tr>
<td>024</td>
<td>Metro Toronto – Scarborough, Borough of (Prior to 1975)</td>
<td>050</td>
<td>Chinguacousy, Township of</td>
<td>076</td>
<td>Townsend Township</td>
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<tr>
<td>025</td>
<td>Hamilton/Wentworth, Regional Municipality of</td>
<td>051</td>
<td>Sarnia, Township of</td>
<td>077</td>
<td>Hamilton</td>
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<tr>
<td>026</td>
<td>Ottawa, City of</td>
<td>052</td>
<td>Dover, Township of</td>
<td>078</td>
<td>Grand River Conservation Authority</td>
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<tr>
<td>027</td>
<td>Sudbury, Regional Municipality of</td>
<td>053</td>
<td>Elliot Lake, Town of</td>
<td>079</td>
<td>Kitchener</td>
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<tr>
<td>028</td>
<td>London, City of</td>
<td>054</td>
<td>Newmarket, Town of</td>
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<tr>
<td>Prefix</td>
<td>Description</td>
<td>Prefix</td>
<td>Description</td>
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<td>080</td>
<td>Halton Region Conservation Authority</td>
<td>099</td>
<td>Peterborough</td>
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<tr>
<td>081</td>
<td>Moira River Conservation Authority</td>
<td>100</td>
<td>Ancaster</td>
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<tr>
<td>082</td>
<td>North Bay / Mattawa Conservation Authority</td>
<td>101</td>
<td>Toronto Central Mapping (CM and WSC 1-3)</td>
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<td>083</td>
<td>Prince Edward Region Conservation Authority</td>
<td>105</td>
<td>Vaughan</td>
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<td>084</td>
<td>Upper Thames River Conservation Authority</td>
<td>107</td>
<td>Highway 407</td>
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<td>085</td>
<td>Telesat Canada</td>
<td>108</td>
<td>Pickering</td>
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<tr>
<td>086</td>
<td>Raisin Region Conservation Authority</td>
<td>109</td>
<td>Niagara Region</td>
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<tr>
<td>087</td>
<td>Erindale College</td>
<td>120</td>
<td>Metro Toronto (MT, T, and CMA)</td>
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<tr>
<td>088</td>
<td>Tillsonburgh</td>
<td>121</td>
<td>Toronto (Reserved-1)</td>
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<tr>
<td>089</td>
<td>St. Lawrence Seaway Commission</td>
<td>122</td>
<td>Toronto (PLATE, CT, OC, SQ 1-30)</td>
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<td>090</td>
<td>Imperial Oil Co.</td>
<td>123</td>
<td>Toronto (Reserved-2)</td>
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<tr>
<td>091</td>
<td>Humber College</td>
<td>124</td>
<td>Toronto (Scarborough)</td>
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<td>Markham</td>
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<td>Toronto (Etobicoke)</td>
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<td>093</td>
<td>Richmond Hill</td>
<td>126</td>
<td>Toronto (YT)</td>
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<td>York, Regional Municipality of</td>
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<td>Toronto (East York)</td>
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<td>095</td>
<td>Petrolia</td>
<td>129</td>
<td>Ajax, Town of</td>
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<td>096</td>
<td>Stratford</td>
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<td>Stouffville</td>
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<td>Brockville</td>
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<td>Whitby</td>
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