BRITISH COLUMBIA
The Best Place on Earth

North American Soil Geochemical Landscapes Project – British Columbia Geological Survey Resources

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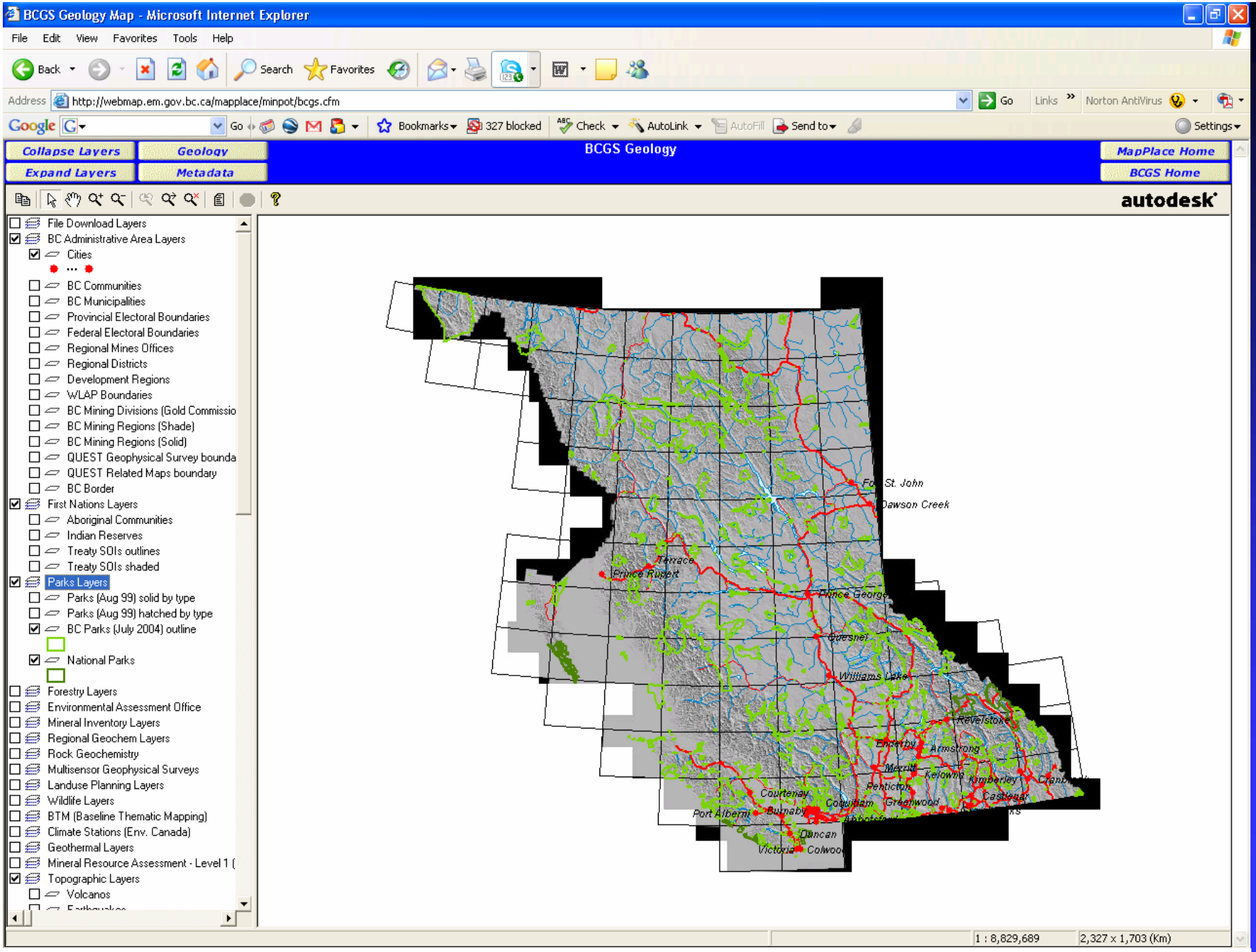
BC Ministry of Energy, Mines & Petroleum Resources

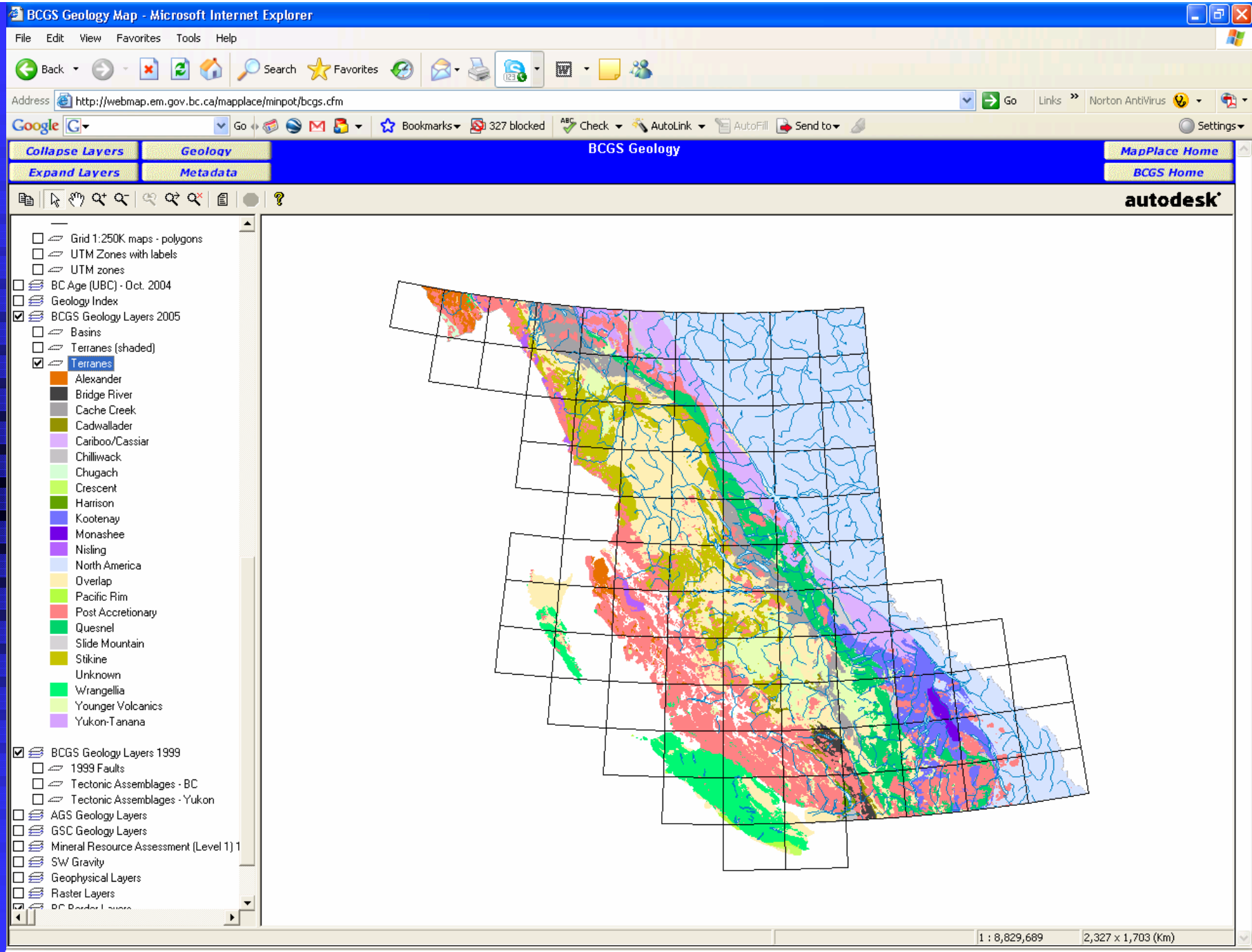
BRITISH COLUMBIA GEOLOGICAL SURVEY

Benefits for NASGLP Site Identification and Data Interpretation

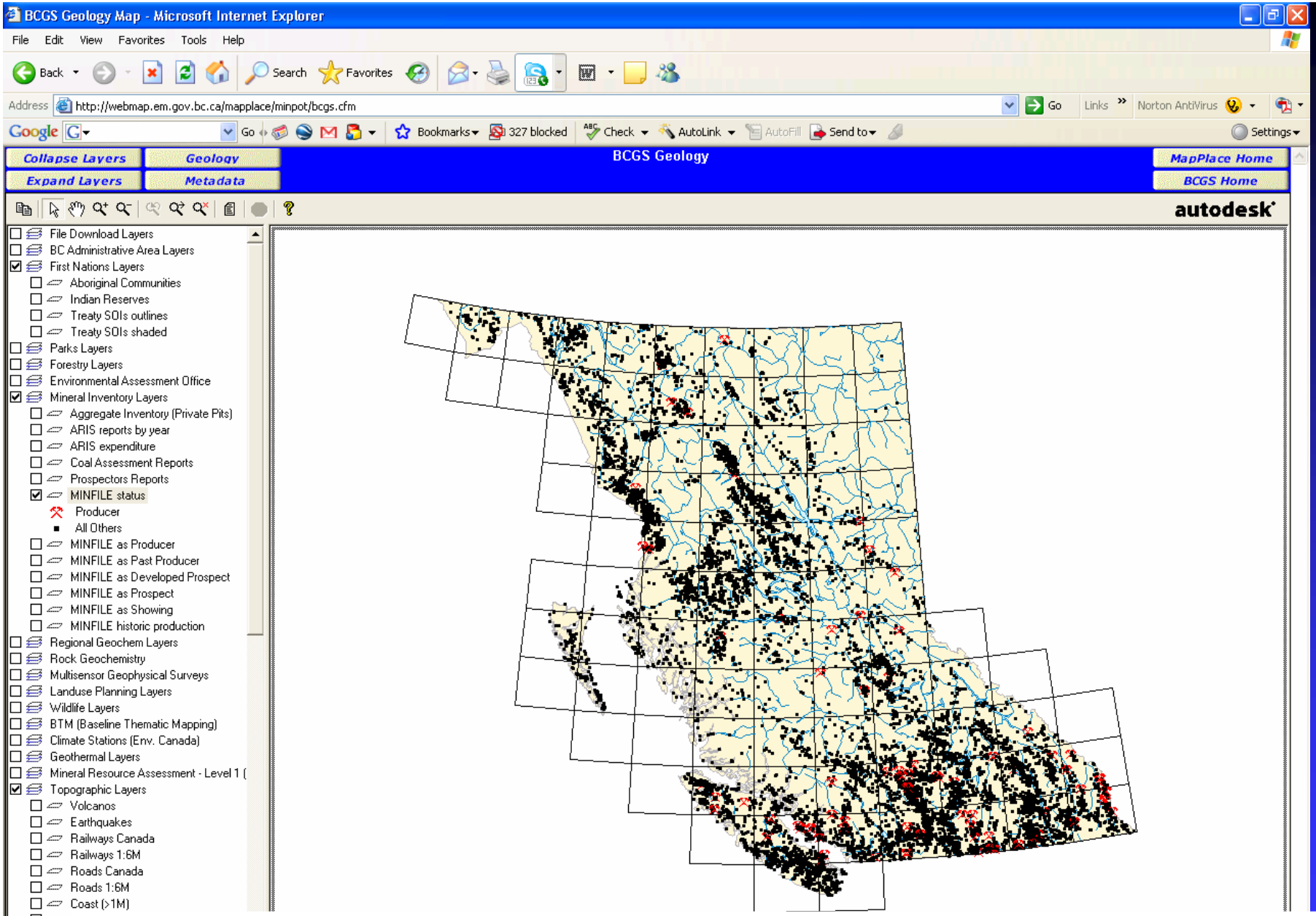
- British Columbia Geological Survey MapPlace portal – gives access to BC geoscience and geographic themes
- Digital geology, drainage geochemistry, MINFILE, topography, maps – a resource for GIS display and interpretation
- Drainage geochemistry for over ~ 70% of BC
- Digital terrain maps for ~ 50% of BC
- Bedrock geology, surficial geology and geochemistry expertise – in-house expertise to assist with data interpretation



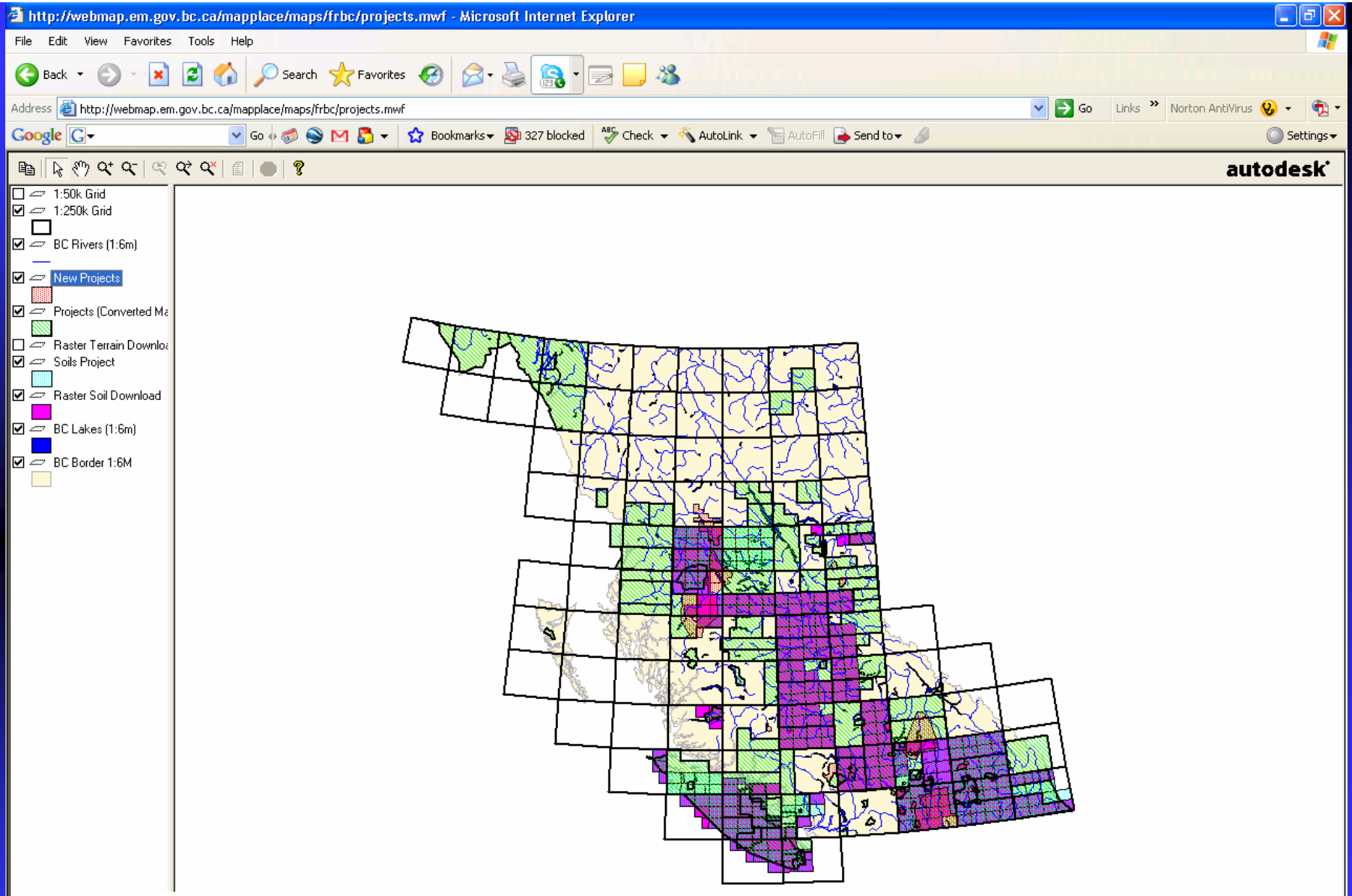
Example of BCGS MapPlace theme– Roads, Cities, Parks, Topography



Example of BCGS MapPlace theme – Geological Framework



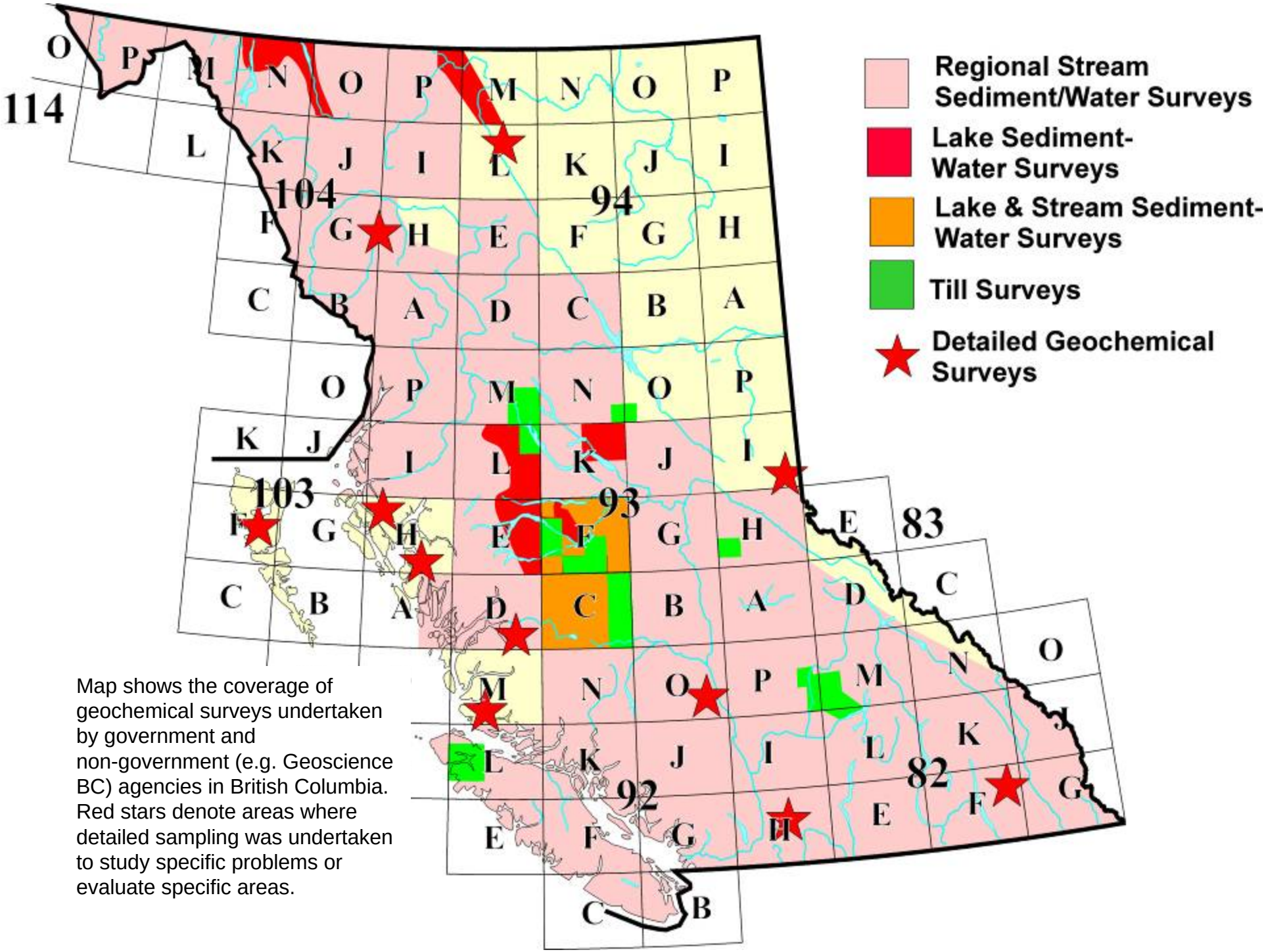
BCGS MapPlace theme – Mineral (MINFILE) Occurrences.
Reports for each occurence are accessed by highlighting its location



BCGS Terrain Mapping Coverage
Includes maps of surficial deposits and soils

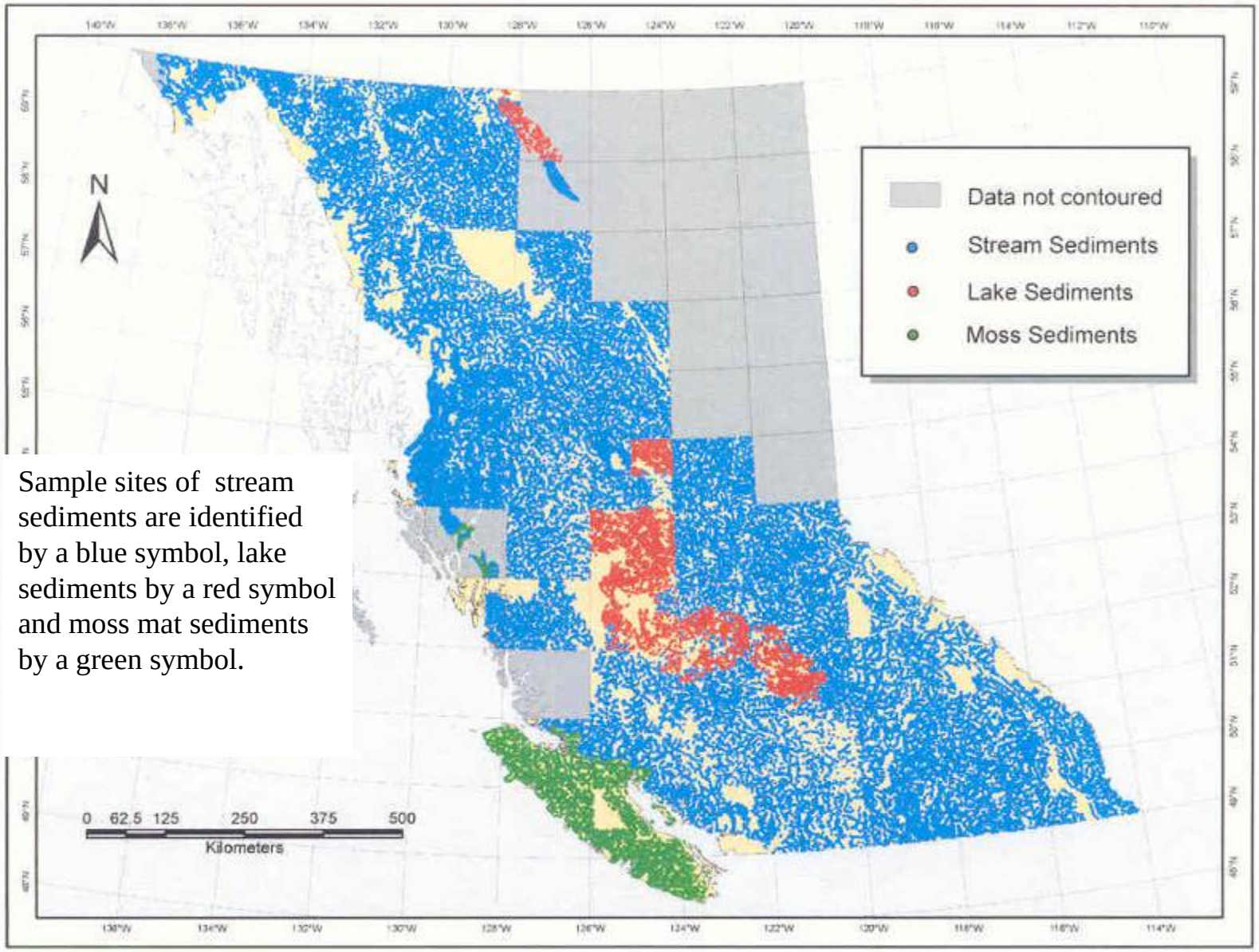
BC Regional Geochemical Survey

- Part of the National Geochemical Reconnaissance (NGR) program
- Surveys since 1976: Stream sediments and waters; lake sediments and waters; sites typically spaced at 1 sample/13km^2
- Data have applications to mineral exploration, assessment of mineral potential and environmental research.
- More detailed stream, till and heavy mineral sampling in selected areas.



Map shows the coverage of geochemical surveys undertaken by government and non-government (e.g. Geoscience BC) agencies in British Columbia. Red stars denote areas where detailed sampling was undertaken to study specific problems or evaluate specific areas.

Sediment sample coverage



Sample sites of stream sediments are identified by a blue symbol, lake sediments by a red symbol and moss mat sediments by a green symbol.

Stream sediment and water sampling in northwestern British Columbia

Stream sediment and water sampling

Previous slide shows sampling in progress as part of a typical reconnaissance-scale stream sediment-water survey. The sediment is being collected from finer textured material on the point bar.

For large regional surveys, there are compromises between the need for speed and ease of sample collection and the effectiveness of the methodology used for detecting anomalous element levels in the source catchment area. Use of fluvial sediment is most suitable for detecting the more geochemically mobile elements such as Mo, Cu, As, Ni and Zn. It is less appropriate for detecting elements such as Ba, Au, Sn, W and Pb that are physically transported in detrital minerals and, as a result, have larger variability in results due to the "nugget" effect.

The sruvey site shown is in the Bowser basin area in northwestern British Columbia. Both sediment and stream water samples were taken at an average density of 1 sample/ per 13km^2. About 0.5 to 1 kg of sediment was collected in a Kraft bag. The water was collected in a 250 ml Nalgene bottle.

Photo credit to Wayne Jackaman.

Lake sediment-water survey

Lake sediment-water survey

Previous slide depicts the emptying of a “Hornbrook” type lake sediment sampler and transfer of the sediment into a sample bag during a routine survey operation.

The Hornbrook sampler is about 40 cm long and 3 cm in diameter. It is weighted close to its lower end to increase penetration into lake bottom materials. It has a one-way flap valve in the tube to retain sediment.

To operate, the sampler is attached to a nylon rope (marked at the meter and 0.5 metre points) and simply dropped from the deck when the helicopter is stationary on the lake. Generally there is sufficient momentum for the sampler to penetrate 20 to 30 cm into the sediment. After being dropped, the sampler is pulled up by hand and the sediments are transferred to a sample bag using a scoop.

Photo credit to Wayne Jackaman.

Moss Mat Sampling – An alternative sediment for sampling in fast-flowing mountain streams

Moss sediment sampling in the Lillooet area. Thanks to Garret Larcroux of the Ts'kw'aylaxw First Nation for assistance with sampling.

Heavy Mineral Sampling

Heavy Mineral Sampling

Previous slide shows Ray Lett, British Columbia Geological Survey and Peter Friske, Geological Survey of Canada, carrying out heavy mineral sampling in a high energy stream in northwestern British Columbia.

About 10 to 12 kg of –12 mesh gravel are recovered by wet screening sediment into a 12 litre pail. The pail is lined with 2 heavy duty PVC bags that are sealed after the sediment has been screened. Moss and conventional stream sediment samples are also taken at each site.

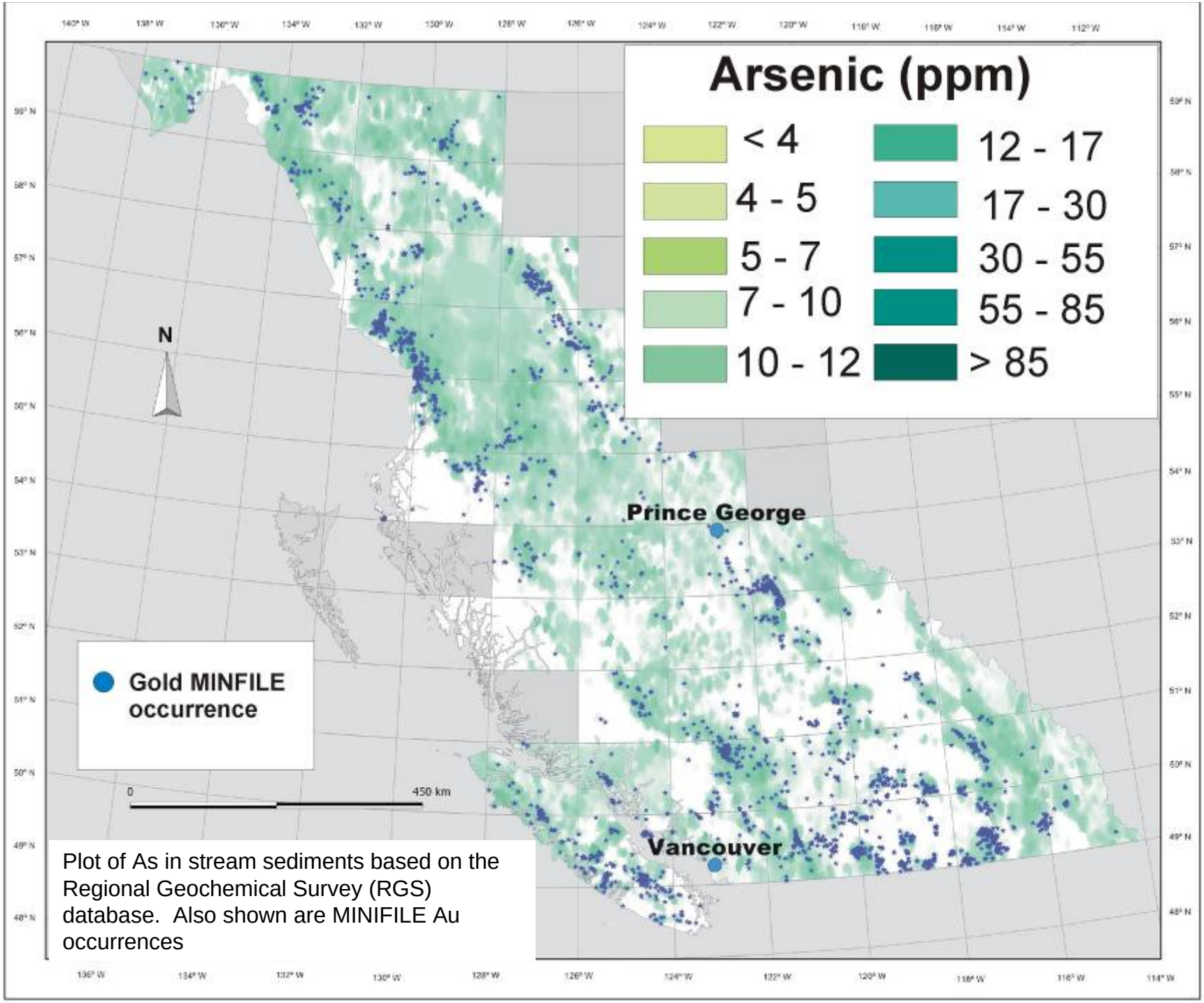
Photo credit to Brian Grant, British Columbia Geological Survey.

Drainage Sample Analysis

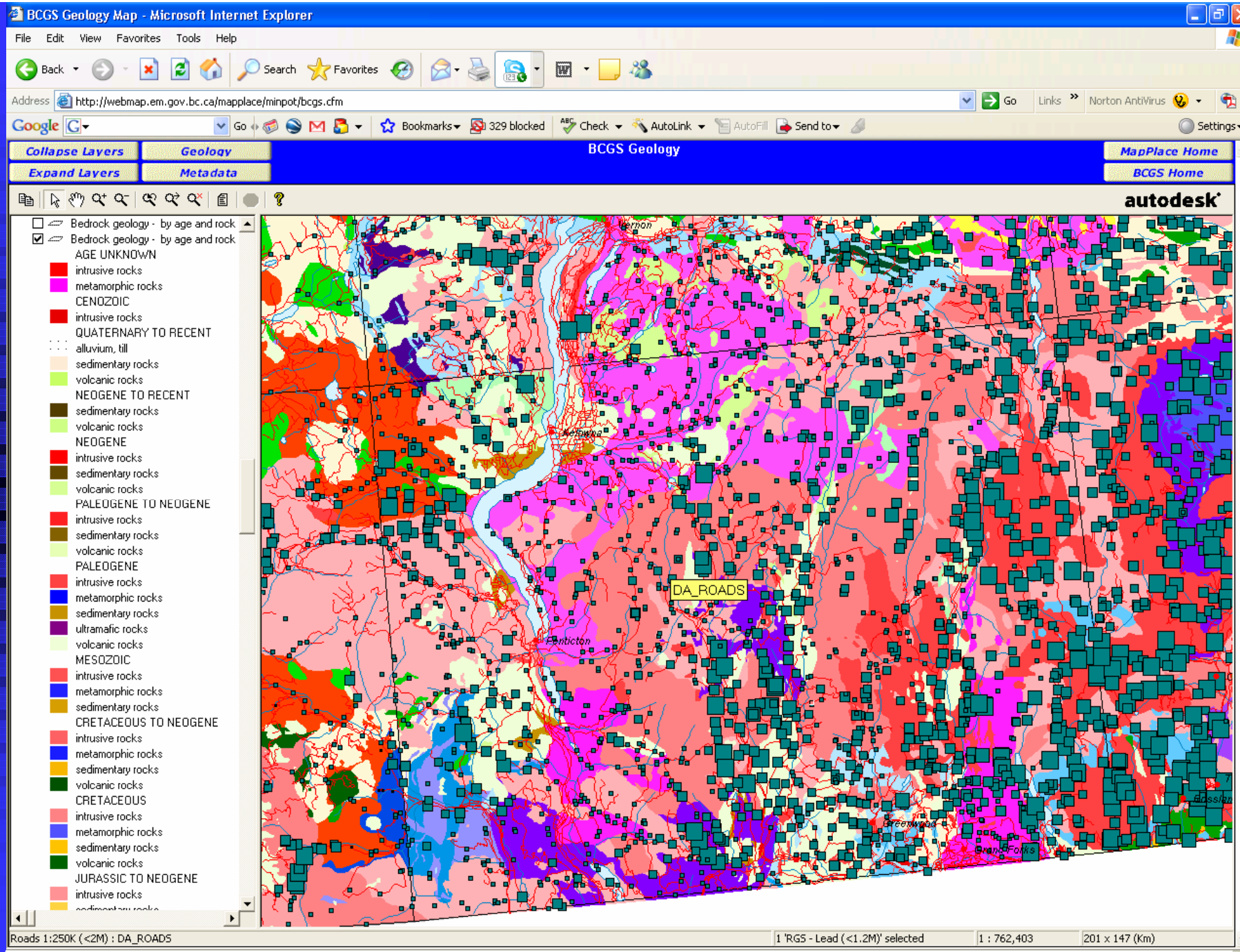
The < 0.177 mm (- 80 mesh) sediment fraction is analysed for:

- 33 elements (including Au) by instrumental neutron activation (INAA)
- 32 elements (including Cu, Pb, Zn, S) by aqua regia digestion-ICPMS
- Loss on ignition, fluorine, tin

Water sampled are analysed for pH, F, U and other trace elements



Plot of As in stream sediments based on the Regional Geochemical Survey (RGS) database. Also shown are MINIFILE Au occurrences



Penticton Map Sheet – Pb in Stream Sediments

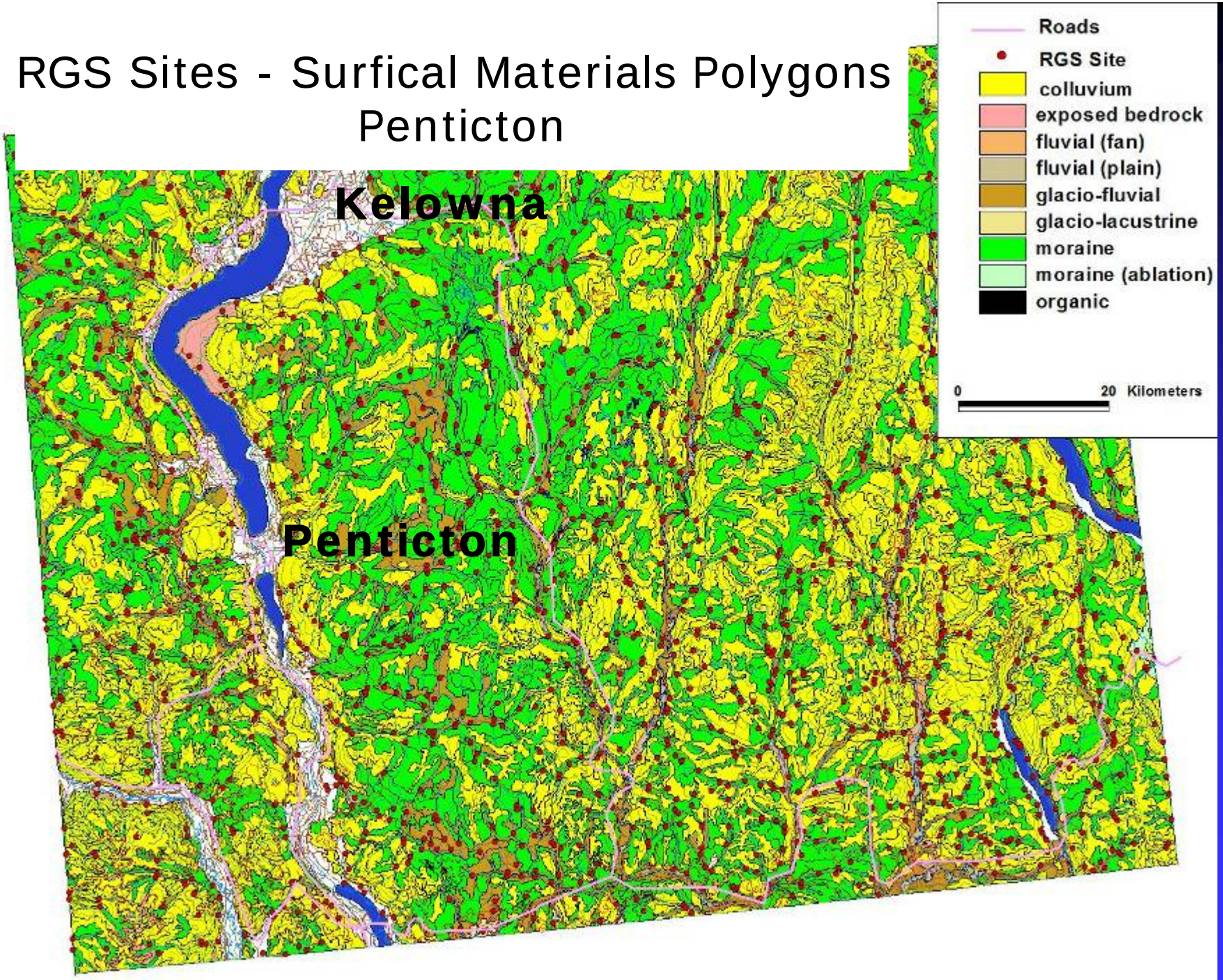
Lead in Stream Sediments in the Penticton Area

Previous slide shows bedrock geology of the Penticton map sheet (NTS 82E).

Source: The MapPlace - BCGS Geoscience Map. Available on-line at http://www.em.gov.bc.ca/Mining/Geolsurv/MapPlace/MoreDetails/geology.htm

Superimposed is a proportional symbol plot of Pb in stream sediments based on the RGS database. Levels of up to 700 ppm were detected in some samples.

RGS Sites - Surfical Materials Polygons Penticton



Surficial Geology of the Penticton Area

Previous slide shows the surficial geology of the Penticton map sheet (NTS 82E).

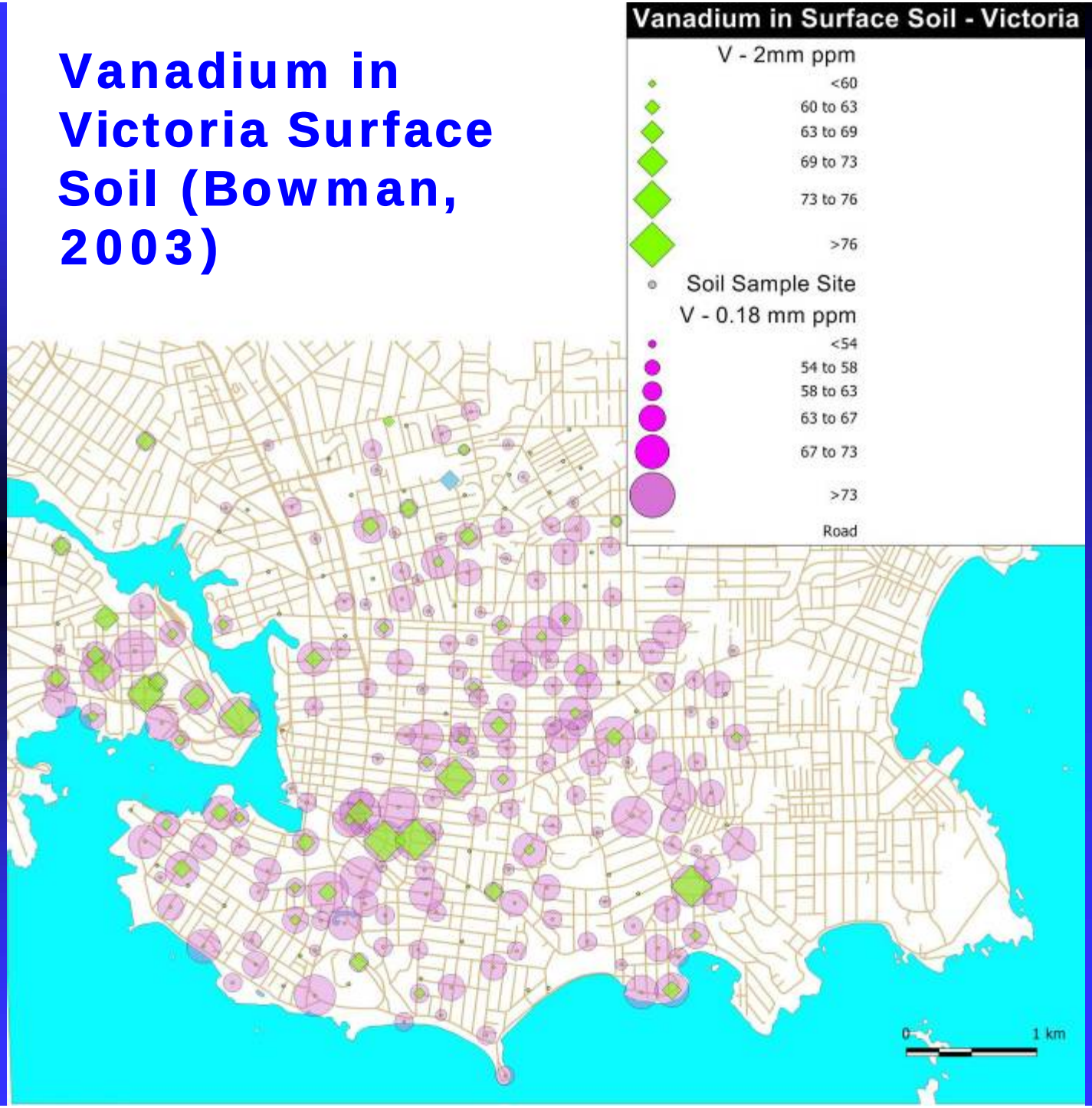
Source: The MapPlace - BCGS Geoscience Map. Available on-line at http://www.em.gov.bc.ca/Mining/Geolsurv/MapPlace/MoreDetails/geology.htm

Urban Geochemistry

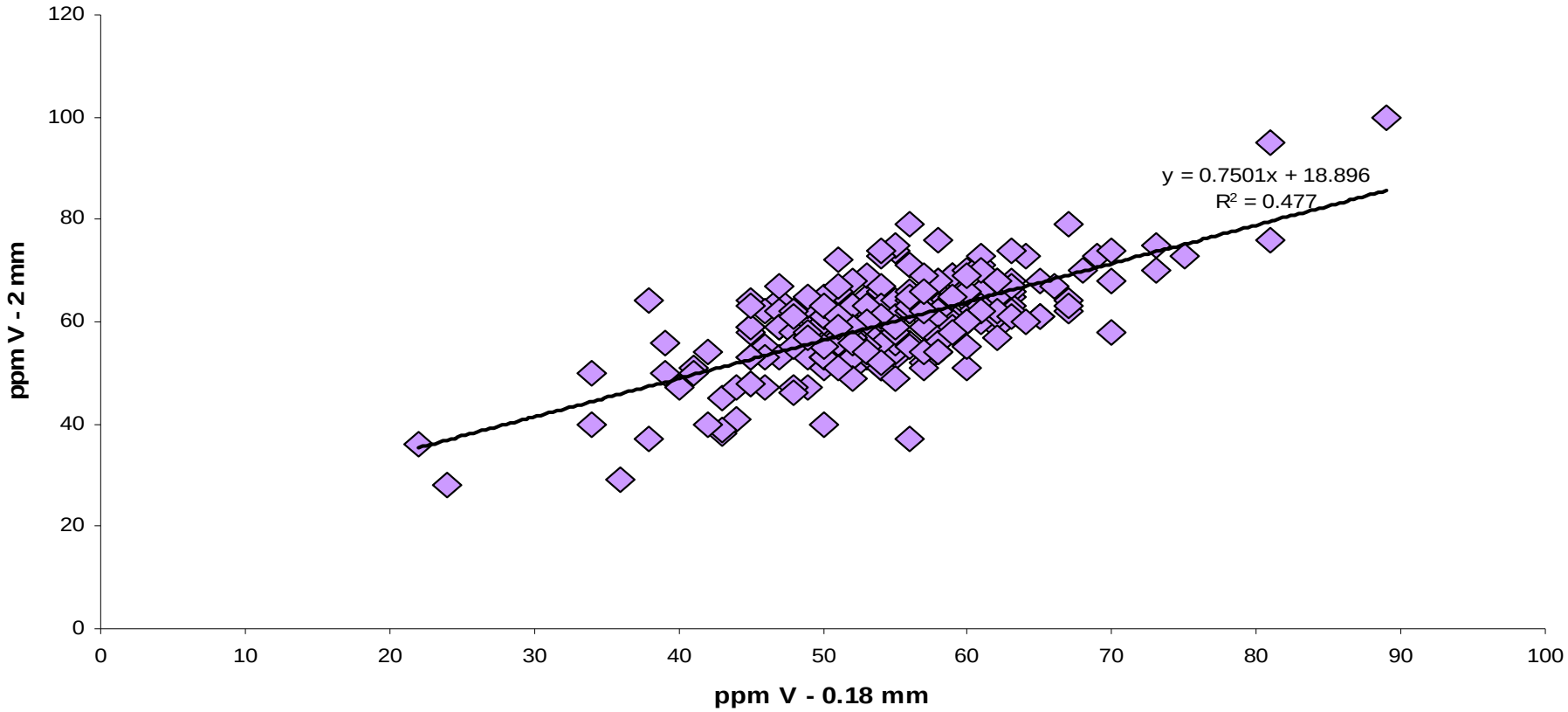
- Study undertaken in 2003 in Victoria, BC. Charlotte Ann Bowman, 2003: Urban geochemistry and potential health implications: Municipality of Victoria, British Columbia, Canada.. Master Thesis, University of Victoria

- 245 surface soil samples collected across Victoria
- - 2 mm & - 0.18 mm fraction analysed for trace elements by aqua regia digestion – inductively coupled plasma mass spectrometry

Vanadium in Victoria Surface Soil (Bowman, 2003)



Vanadium in < 2mm and < 0.18 mm fractions



Any reaction? ---