



# **Granular Resource Inventory**

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## **An Overview of Canadian Examples**

Compiled by

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Appendix 1: An Overview of Canadian Granular Resource Management

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## **Introduction**

AggMapR Inc. conducted a review of aggregate resource inventory programs of the various Canadian Provincial Geological Surveys on behalf of Indian and Northern Affairs Canada (INAC). The study included a review of: the legislative framework affecting aggregate extraction; the style and details of their surficial and aggregate related surveys; the detail of mapping of deposit location, sampling and testing of materials for quality; and public accessibility to information on granular / aggregate resource materials.

The review indicated that all provinces have legislation governing extraction of granular materials however the extent that it is applied varies substantively. The terminology within the legislation varies from province to province and this individual terminology is then frequently incorporated into the aggregate mapping programs. Ownership of aggregates varied from province to province. Some provinces or in some parts of a province, unconsolidated (non-bedrock materials) aggregates were included in the surface rights ownership. Other provinces retained varying degrees of ownership on the subsurface aggregate materials, unless the land grants specifically include the aggregate and or mineral rights. All provinces exercised some control over aggregate extraction operation depending upon the nature of the ownership. Where ownership of aggregates was with the land title, environmental legislation was used to control extraction activities. Some provinces had specific legislation governing extraction, varying from the *Quarry Materials Act* in Newfoundland, where the aggregate materials are owned by the Crown unless specifically included in the land grant; to Ontario, where the *Aggregate Resources Act* designates areas of the province where provincial control of aggregate extraction applies to private lands.

The granular (aggregate) mapping programs in some provinces form a component of other mapping initiatives, typically surficial and glacial (Quaternary) mapping programs. While a number of provinces have previously undertaken detailed aggregate resources mapping programs, only a few of the provinces have retained a complement of staff dedicated to aggregate mapping initiatives.

In setting out to undertake an overview of aggregate resources inventories, a questionnaire (Table 1) was developed and telephone interviews conducted with staff at the various provincial geological surveys. Subsequently, the questionnaires were circulated to these staff. The response was extremely poor, perhaps for a variety of reasons including the timing and the detail on the questionnaire. The April mail out, was generally identified with being in conflict with staff preparations for their upcoming field season. Similarly, follow up telephone calls to collect the information also received a poor reception and staff generally suggested visiting their provincial websites for the information. The questionnaires that were completed were incomplete and many included comments that suggested visiting their websites. This should not be considered as a negative, because the lack of staff response was most frequently offset by the availability of data on the websites. The majority of the information summarized in this study was gleaned from the provincial websites.

A review of the websites and legislation demonstrates the diversity of both the terminology and availability of data, whether it is geological or aggregates mapping, in each of the provinces. One common element to all websites was use of the term “geology” as a “key word” as the starting point for any search for “aggregates” on the provincial websites. Often the word “aggregates”



would not appear during a keyword search. However the word would generally appear elsewhere in the website, indicating that the word was not a given status (not listed) as a “key word” on the home page of the website.

The website pathways used in the materials presented, have been compiled for each province and the web links are shown for each step in the sequence used to drill down through the website to acquire access to the information or data.

Information collected from each of the websites has been compiled either by selective downloading of information or through a series of screen captures that have been transferred into a slide presentation format for each province.

### **Report Layout**

The layout of the report set out a series of chapters, one for each province starting in the west with British Columbia and progressing eastwards through to Newfoundland and Labrador.

Each provincial chapter (to the extent possible) sets out the information under the following headings:

1. Aggregate Ownership
2. Legislation
3. Resource Management (Land Use Planning)
4. Granular Resource Inventories
5. Public Access and Availability of Data
6. Reports/Publications
7. References

**Appendix 1** is the electronic Power Point slide presentation delivered at a workshop entitled the “*The NWT Granular Users Forum*” hosted by Indian and Northern Affairs Canada (INAC) in Yellowknife, (September 27-28, 2006). Participants included representatives from Aboriginal organizations, government, regulators, industry, resource management bodies, consultants and others with responsibilities for land use planning, screening and environmental impact assessment or environmental management. This presents a summary of information compiled from the provincial surveys.

**Appendix 2** includes the slide presentations prepared for each province that is a detailed review of the provincial websites, including: British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, New Brunswick, Nova Scotia, Prince Edward Island and Newfoundland – Labrador.

**Appendix 3** is a slide presentation that:

- a) Compares the total Provincial Stone and Sand & Gravel Production by Year in each province and territory for the period 1995 to 2005 (Slides 1 to 12); and
- b) Provides a comparison of the Annual Stone and Sand & Gravel Production within in each province and territory also over the period 1995 to 2005.

**Table 1: Questionnaire - Granular Resource Inventories**  
**Information Requested by AggMapR Inc. 2391 Tenth Side Road, Bradford, Ontario, L3Z 2A4**

**Questionnaire - Granular Resource Inventories - Sample derived from various Provincial Responses.**

Editors Note: Blank Lines and Some Blank Spaces have been merged or removed for printing proposes.

<b>1 Sand and Gravel Resources</b>				Comments
Style of Map Coverage		Coverage of province (%)	Area (Hectares or Km2)	
	By Map Sheet	~16%	This is a complicated question; I have provided an estimate based on the equivalent number of 1:250 000 NTS sheets mapped; this estimate is based on data that is publicly available (see comments at bottom of this sheet) and does not included inventories done privately by the aggregate industry, municipalities, cities, or any other entity interested in gravel resources	
	Transportation Corridor			
	Other (specify)			
	-			
	-			
Scale of mapping		Coverage of province (%)	Area (Hectares or Km2)	
	1:50000	~6%		
	1:20000			
	1:10000			
	Other (specify)	remaining ~10% done at a variety of scales and may not necessarily be continuous over a whole 1:20 000, 1: 50 000, or 1:250 000-scale mapsheet (i.e. could be corridors or specific areas that do not conform to an NTS mapsheet		
	-	boundary)		
	-			
<b>2 Bedrock Resources</b>				Comments
Style of Map Coverage		Coverage of province (%)	Area (Hectares or Km2)	
	By Map Sheet			
	Transportation Corridor			
	Other (specify)			
	-			
	-			
Scale of mapping		Coverage of province (%)	Area (Hectares or Km2)	
	1:50000	~20%		
	1:20000			
	1:10000			
	Other (specify)	A tectonic assemblage map for the Province of (name deleted) has been compiled at 1:2 000 000-scale; the mineral exploration industry and producing mines have produced numerous other bedrock geology maps, at various scales, some are available to the public (see ARIS and MINFILE comment below) while others are most certainly held in company files		
	-			
	-			

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<b>3 Format of Inventory Programs</b>				Comments
Desk Top		Coverage of province (%)	Area (Hectares or Km2)	
	Airphoto Analysis	I would say that most of the inventories completed to date would use all three of these data sources (both primary and secondary) to produce aggregate potential/inventory maps; as I have not been involved with many of the aggregate potential/inventory projects completed for the Province, it would be impossible for me to estimate values for the		
	Surficial Geology			
	Bedrock Geology			
Details of Sampling		Coverage of province (%)	Average # per Map when used	
	Grab (Hand) Samples	Similar to the comment made above, all methods listed here have been used but I cannot estimate values for the "coverage of province (%)" column		
	Backhoe Test Pits			
	Auger Holes			
	Drilling			
	Other (specify)			
Field and Laboratory Testing		Average Number per Year	% Samples (Item 3) Analyzed	
	Grain Size Analysis			Same as above.
	Petrographic Analysis			
	Los Angeles Abrasion			
	Other (specify)			
<b>4 Publication Format</b>		No. Completed to Date	Coverage of province (%)	Comments
Report Format				
	Open File Reports			see comments under item 1.
	Published Reports			see comments under item 1.
	Unpublished Reports			see comments under item 1.
	Other (Specify)			
Base Map Format				
	Topographic Base Map		all; at various scales	
	Surficial /Terrain Units		all at >1:2 000 000-scale; portions of at scales <1:2 000 000	
	Bedrock Geology		all at >1:2 000 000-scale; portions of at scales <1:2 000 000	
	Airphoto		all; at various scales	
Map Based Information				
	Sample Localities			don't understand this question
	Terrain Units			don't understand this question
	Geology Units			don't understand this question
	Material Classification			don't understand this question
	Quality or Potential Use			don't understand this question
	Other (Specify)	(if available please provide a sample legend)		

**Table 1: Questionnaire - Granular Resource Inventories**  
**Information Requested by AggMapR Inc. 2391 Tenth Side Road, Bradford, Ontario, L3Z 2A4**

Contact Information				
	Name Prime Contact			
	Ministry/Department			
	Division			
	Section			
	(Misc.)			
	Phone Number			
	Email			
	Publication of Information (if available, please send electronic listing of publications)			
<b>5</b>	<b>Electronic Access to Reports</b>	<u>Number or % pre-2000</u>	<u>Number or % 2000 - 2005</u>	<u>Weblink or Comments</u>
	Report Types			
	Open File Reports		cannot estimate percentages	see below for websites
	Published Reports		cannot estimate percentages	see below for websites
	Unpublished Reports		cannot estimate percentages	see below for websites
	Other (Specify)			
	Report Formats (Specify)			
	Unformatted Text		cannot estimate percentages	see below for websites
	Formatted Text (Specify)		cannot estimate percentages	see below for websites
	-			
	Portable Document Format (pdf)			
	Public Website / Weblink			
	Other Website / Weblink			
	(if available on-line, please provide list of weblink)			
	Contact Information			
	Name Prime Contact			
	Ministry/Department			
	Division			
	Section			
	(Misc.)			
	Phone Number			
	Email			

**Table 1: Questionnaire - Granular Resource Inventories**  
**Information Requested by AggMapR Inc. 2391 Tenth Side Road, Bradford, Ontario, L3Z 2A4**

<b>6 Electronic Access to Maps &amp; Data</b>		<u>Number pre-2000</u>	<u>Number 2000 - 2005</u>	<u>Specify Format (Software, Pdf, etc.)</u>
	Electron Report Format		cannot estimate percentages	see below for websites
	Other (specify)			
	Electronic Map Data Format			
	CAD Format		cannot estimate percentages	see below for websites
	GIS Format		cannot estimate percentages	see below for websites
	Pdf Format Only		cannot estimate percentages	see below for websites
	Electronic Map Data Content			
	Sample Coordinates		cannot estimate percentages	see below for websites
	Field Analyses		cannot estimate percentages	see below for websites
	Laboratory Analyses		cannot estimate percentages	see below for websites
	Multi-element Database		cannot estimate percentages	see below for websites
	Other (Specify)			
	-			
	-			
		(if available on-line, please provide weblink)		
	Contact Information			
	Name Prime Contact			
	Ministry/Department			
	Division			
	Section			
	(Misc.)			
	Phone Number			
	Email			
		(if available on-line, please provide weblink)		
<b>7 Legislation - Licensing and Permitting Requirements for Extraction of Granular Resources</b>				<b>Weblink or Comments</b>
Legislation applying to: Private Land (Bedrock) Private Land (Sand and Gravel) Crown Land (Bedrock) Crown Land (Sand and Gravel)				
(if available on-line, please provide weblink)				

**Table 1: Questionnaire - Granular Resource Inventories**  
**Information Requested by AggMapR Inc. 2391 Tenth Side Road, Bradford, Ontario, L3Z 2A4**

<b>8</b>	<b>Additional Comments - Helpful links as provided by Province of British Columbia</b>
	All publicly available aggregate data for the Province of BC can be found at:
	<a href="http://www.em.gov.bc.ca/subwebs/oilandgas/aggregates/aggregates.htm">http://www.em.gov.bc.ca/subwebs/oilandgas/aggregates/aggregates.htm</a>
	<a href="http://www.em.gov.bc.ca/mining/Geolsurv/MapPlace/themeMaps.htm">http://www.em.gov.bc.ca/mining/Geolsurv/MapPlace/themeMaps.htm</a>
	<a href="http://webmap.em.gov.bc.ca/mapplace/minpot/aggregate.cfm">http://webmap.em.gov.bc.ca/mapplace/minpot/aggregate.cfm</a>
	Volumes of other spatial geologic data can also be found at MapPlace.
	Assessment reports for mineral properties in BC can be found at:
	<a href="http://www.em.gov.bc.ca/mining/Geolsurv/Aris/default.htm">http://www.em.gov.bc.ca/mining/Geolsurv/Aris/default.htm</a>
	Information on mineral occurrences BC can be found at:
	<a href="http://www.em.gov.bc.ca/mining/Geolsurv/Minfile/default.htm">http://www.em.gov.bc.ca/mining/Geolsurv/Minfile/default.htm</a>
	On-line surficial geology, aggregate potential, and bedrock geology reports and maps for BC can be found at:
	<a href="http://www.em.gov.bc.ca/subwebs/oilandgas/aggregates/studies.htm">http://www.em.gov.bc.ca/subwebs/oilandgas/aggregates/studies.htm</a>
	<a href="http://www.em.gov.bc.ca/mining/Geolsurv/Publications/default.htm">http://www.em.gov.bc.ca/mining/Geolsurv/Publications/default.htm</a>
	Information regarding Crown land, tenure, and permission to mine aggregate in BC can be found at:
	<a href="http://www.frontcounterbc.gov.bc.ca/">http://www.frontcounterbc.gov.bc.ca/</a>
	<a href="http://www.em.gov.bc.ca/mining/Healsafe/mineereg.htm">http://www.em.gov.bc.ca/mining/Healsafe/mineereg.htm</a>

**This information will assist Dept. of Indian Affairs and Northern Development with granular inventories in northern Canada**

**Please Direct Questions to Doug Vanderveer, PGeo.; email: [dvanderveer@aggmapr.com](mailto:dvanderveer@aggmapr.com) or call 905-775-8090**

## **1.0 British Columbia Aggregate Resources**

### **1.1 Aggregate Ownership**

Ownership of the land upon which pits occur varies. Some are on privately owned and operated while others are on Crown Land, First Nations Band Land or on private land owned by someone other than the pit operator. Aggregate pits and quarries are designated as mines.

#### **Private Land**

The Ministry of Energy, Mines and Petroleum Resources is responsible for the planning, management and regulation of aggregates, including permitting, health, safety and reclamation. Owners or operators of all private aggregate pits must file Notices of Work as part of the permitting and reclamation process.

#### **Crown Land**

On Crown Land applications are submitted for Quarry Tenure on Crown Land administered by the Ministry of Agriculture and Lands – Crown Land Administration Division under the “[Crown Land Operational Policy: Aggregate and Quarry Materials](#)” (Appendix A) located at the on-line weblink at:

[http://www.al.gov.bc.ca/clad/leg\\_policies/policies/aggregates.pdf](http://www.al.gov.bc.ca/clad/leg_policies/policies/aggregates.pdf)

The objectives of the policy are:

- To provide policy for the use of Crown land containing or potentially containing quarry materials required for commercial and industrial purposes.
- To enhance the viability of quarry operations by protecting and assuring a continuous supply of Crown land for quarry materials extraction by private and public sectors.
- To ensure an equitable allocation of quarry lands among private operators and public agencies.
- To ensure efficient use of Crown land containing quarry resources.
- To provide a fair economic return to the Crown for the extraction of quarried materials in a manner which is equitable to the quarry industry.
- To foster the safe and orderly development of quarry operations authorized on Crown land pursuant to programs and legislation administered by government.
- To promote administrative efficiency through the utilization of the technical expertise of other agencies involved in safety and reclamation of mining and quarry lands.
- To facilitate the operation of quarry activities in a manner which minimizes adverse environmental impacts on Crown land.
- To encourage the common use of quarry sites by private operators where small quantities of materials are required on an occasional basis.

A licence of occupation is the normal form of tenure for quarry dispositions during the promotion (capital raising), physical development and production stages. The normal term issued is five years, but where need is proven (e.g. quarry operator has long-term obligations as a supplier, quarry operator has diligently used the site for several years and continued use can be

expected), a longer-term tenure may be offered. A replacement licence may be issued with a term of up to 10 years.

## **1.2 Legislation**

### **Private Land: Licensing and Permitting – Ministry of Energy & Mines**

In British Columbia various Federal, Provincial and local agencies may each have authority to govern aspects of the aggregate industry and require permits. To begin the permit application process, potential operators should contact a Ministry of Energy & Mines - Mines Branch Regional Office to obtain a “Notice of Work and Reclamation for Sand and Gravel and/or Rock Quarry” form, which serves as a Mines Act permit application. In reviewing the Notice of Work, the Ministry of Energy & Mines will refer the application to other applicable Federal and Provincial agencies and initiate a public review if required.

### **Other Legislation**

Aggregate Operations may also subject to the following Legislation: Canadian Environmental Assessment Act, Fisheries Act, Canadian Environmental Protection Act, Migratory Birds Convention Act, Mines Act, Canada Wildlife Act, International River Improvements Act, Navigable Waters Protection Act, Local Government Act, Wildlife Act, Waste Management Act, Land Act, Soil Conservation Act, Forest Land Reserve Act, Agricultural Land Reserve Act, Highway Act, Forest Act, Range Act, Forest Practices Code Act, Heritage Conservation Act, Water Act, Environmental Assessment Act

These requirements are described in the "[Aggregate Operators Best Management Practices Handbook for British Columbia](http://www.em.gov.bc.ca/Mining/MiningStats/55AOBMPHand_pdf.htm)" (Appendix A) which is available on-line at:

[http://www.em.gov.bc.ca/Mining/MiningStats/55AOBMPHand\\_pdf.htm](http://www.em.gov.bc.ca/Mining/MiningStats/55AOBMPHand_pdf.htm)

## **1.3 Resource Management (Land Use Planning)**

Information about aggregate pits in British Columbia is collected and managed primarily by two ministries - the Ministry of Transportation and Highways and the Ministry of Energy, Mines and Petroleum Resources. The Ministry of Transportation and Highways has collected data on 4 to 5 thousand public pits in order to ensure an adequate supply of good quality gravel is available for construction, maintenance and rehabilitation of highways in the province.

These data were managed by the Ministry of Transportation and Highways using three systems: ADIS (aggregate deposit information system), ARMS (aggregate resource management system) and RAAMS (regional aggregate account management system).

These 3 systems will be replaced by a new system, GMSS that will assemble the data of the previous systems. This new database will provide more complete data and eliminate duplication and errors in location and status of pits.



Efforts to establish a provincial inventory of private pits have been based on records derived from the permitting and reclamation process administered by the Ministry of Energy, Mines and Petroleum Resources. Individual pit identifications and locations were obtained, reviewed and upgraded. The locations were plotted on 1:50 000 scale base maps, digitized and compiled in a simple dBase format.

In total, over six hundred currently permitted pits, and a lesser number of reclaimed pits, have been located accurately for inclusion in the database. Where possible, the landform associated with each pit has also been determined.

Aggregate demand for construction in the Lower Mainland is estimated to be 20 to 30 million tonnes per year, including fill and backfill not normally included in the definition of aggregate but originating from similar sources. Aggregate sources include: the following general locations:

- Coastal pits on tidewater - 8 million tonnes per year
- North side of the Fraser River - 4 million tonnes per year
- North side of the Fraser River - 4 million tonnes per year
- Matsqui/Abbotsford and Chilliwack - 4 million tonnes per year
- Fraser River - 4 million tonnes per year (including 3 million tonnes of dredged sand)
- Quarries on Texada - 1 million tonnes per year
- Imports from the US - 1 million tonnes per year

#### **1.4 Granular Resource Inventories**

The Aggregate Project was established in order to effectively manage Aggregate Resources in British Columbia.

The goals of the program are:

- To establish an Inventory of natural and crushed aggregate pits in British Columbia
- To produce a series of Aggregate Potential Maps for key growth and development areas in the province
- To improve information transfer and data management between key provincial ministries.

The [Northeast BC Aggregate Mapping Program](#) is managed by the Oil and Gas Division, Resource Development and Geoscience Branch.

#### **1.5 Public Access and Availability of Data**

##### **On-Line Access to Information**

Online interactive access to the data and mapping is available from the Aggregate Project at: Website: <http://www.em.gov.bc.ca/Mining/Geosurv/Surficial/aggregate/default.htm>, shown in Figure 1

Digital Files of Aggregate Resource Potential maps can be download or viewed interactively. The index map (Figure 2) provides an indication of where the aggregate mapping has been

completed with a focus on areas of population and aggregate demand. Aggregate occurrence maps are available on line as shown in Figure 3. Metadata for the [Aggregate Potential Maps](#) and the [Aggregate Inventory](#) are available free in [downloadable digital files](#) and are viewable through the Aggregate Inventory (Private Pits) layer within the Mineral Inventory layer group.

Aggregate potential maps provide guidelines for testing, evaluating and managing aggregate resources within a defined area. The maps provide first approximation estimates of broad, regional aggregate distribution and are suitable for use by municipal and landuse planners as well as the aggregate industry.

### **Digital Data Downloads**

- Aggregate Potential Studies of seven (7) areas (Figure 4), including: Prince George, Okanagan (Figure 5), Nanaimo, Sea-to-Sky (Figure 6), Sunshine Coast, North Coast and Northeast BC. The aggregate resource potential is represented as polygons on the map and qualitatively ranks the relative potential of the areas. The studies include landforms and pit locations.
- Aggregate Pit data including: Private Pits based on compilation of Notices of Work (1996), Construction Aggregate Operations (2004), Public and Private Pits (2004), data from the “Lower Mainland Construction Aggregates Demand Study” (2005), Construction Aggregate Operations in BC (2005) and the Northeast BC Aggregate Mapping Program (2006) were added in recent years;
- Aggregate Tenures data current as of April 27, 2005 and includes
- GSC Surficial Geology layer (1:5M) from Surficial materials of Canada, Fulton, R.J.; Geological Survey of Canada, "A" Series Map 1880A, 1995.

Figure 3 shows a sample of the Interactive Mapping of aggregate occurrence map for the “Northeast British Columbia Aggregate Mapping Program” located at:

<http://www.em.gov.bc.ca/subwebs/oilandgas/aggregates/map/aggregate.svg>

### **Pit and Quarry Database:**

The database of private aggregate pits in British Columbia was compiled as part of the B.C. Geological Survey Branch's Aggregate Inventory Project. In this compilation, private pits were considered to be only those natural aggregate occurrences for which an application by an operator for a Notice of Work had been received and subsequently issued by the Ministry of Employment and Investment. All other pits, including public pits operated by the Ministry of Transportation and Highways, are not included. Information about each pit in the database file includes its location (both latitude/longitude and UTM coordinates), NTS map sheet number, Notice of Work file number and status (active/inactive) and the type of landform hosting the pit. The inventory can be viewed on the MapPlace Aggregate Potential Maps.

### **1.6 Reports/Publications**

Various Publications on Aggregates are available for download for free on PDF

Attributes include: material type, thickness, area, volume, surficial drainage, overburden type and thickness, etc.

Information on aggregates including statistics and aggregate potential maps are available from the “**MapPlace**” at:

<http://www.em.gov.bc.ca/Mining/Geolsurv/Surficial/aggregate/default.htm>.

An index and interactive map of aggregate potential mapping (Figure 7) is available at:

<http://www.em.gov.bc.ca/Mining/Geolsurv/MapPlace/MoreDetails/aggregate.htm>

Maps of seven (7) aggregate potential studies (Figure 4), including: [Prince George](#), [Okanagan](#) (Figure 5), [Nanaimo](#), [Sea-to-Sky](#) (Figure 6), [Sunshine Coast](#), [North Coast](#) and [Northeast BC](#). [Digital Data Downloads](#) are available. Each study represents areas of aggregate resource potential as polygons on the map and qualitatively ranks the relative potential of the areas. The studies include landforms and pit locations. The NEBC Aggregate area displays and reports on roads, showings, prospects and deposits. Other Aggregate Pit data displayed include: Private Pits (permitted and reclaimed) based on an 1996 compilation of Notices of Work ([Open File 1996-5](#)); Construction Aggregate Operations, Public and Private Pits compiled in March 2004.

The Legend Window is organized into themes: geology, mineral occurrence, ARIS and mineral title layers. The aggregate potential layers are located next to the geology layers in the legend and include aggregate pit layers for the Okanagan, Nanaimo, Sea-to-Sky, Sunshine Coast and North coast areas. Reports and photos of the aggregate pits are available for most of the pits.

Information on Surficial Geology mapping is available online through a link to a map index and viewer (Figure 8), which can be found at:

[http://www.em.gov.bc.ca/Mining/Geolsurv/MapPlace/MoreDetails/OF\\_13.htm](http://www.em.gov.bc.ca/Mining/Geolsurv/MapPlace/MoreDetails/OF_13.htm)

The surficial geology can be viewed interactively as shown in Figure 9 at:

[http://webmap.em.gov.bc.ca/mapplace/minpot/OF\\_13map.cfm](http://webmap.em.gov.bc.ca/mapplace/minpot/OF_13map.cfm).

## **1.7 References**

1. Title: Aggregate Resource Potential of the Nanaimo Area  
Open File #1998-12 (1 inch = 1 mile)

Author: N.W.D. Massey A. Matheson and P.T. Bobrowsky.

Product No.: 7655001010

Ministry Reference: OF98-12

Category: Miscellaneous

Format: Soft Cover

Additional Information:

2. Title: Aggregate Resource Potential of the Okanagan Area  
Open File #1998-5

Author: P.T. Bobrowsky N.W.D. Massey and A. Matheson.

Product No.: 7655001004

Ministry Reference: OF98-5

Category: Miscellaneous

Format: Soft Cover

Additional Information:

3. Title: Surficial Geology Map Index of British Columbia  
Open File #1992-13

Author: P.T. Bobrowsky T. Giles and W. Jackaman

Product No.: 7655000876

Ministry Reference: OF92-13

Category: Miscellaneous

Format: Soft Cover

To Order: Crown Publications Inc.

4. Title: Vancouver Island: Surficial Geology Map

Number of Pages: 1

ISBN: 0-7726-5469-7

Product No.: 7610003193

Ministry Reference: 7610003193

Category: Ecosystems

Format: Poster

Related Publications 7610003190 Geomorphology of Vancouver Island: Extended Legends to Nine Thematic Maps (RR02)

5. Title: Sunshine Coast Aggregate Potential Mapping Project

Author: Ahren J. Bichler, Elizabeth D. Brooks and Peter T. Bobrowsky

Product No.:

Ministry Reference:

Category: Miscellaneous

Format: Digital/Geological Fieldwork 2001, Paper 2002-1

To Order:

Additional Information: Sunshine Coast, resources, inventory, database

6. Title: Applied Surficial Geology Program: Aggregate Potential Mapping, Squamish Area

Author: V. M. Lemon

Product No.:

Ministry Reference:

Category: Miscellaneous

Format: Digital/Geological Fieldwork 1992, Paper 1993-1

To Order:

Additional Information: British Columbia Geological Survey Branch

7. Title: Sea to Sky Aggregate Potential Project

Open File # 2001-12

Author: A.S. Hickin, E.D. Brooks, A.B. Dixon-Warren, P.T. Bobrowsky

Product No.:

Ministry Reference:

Category: Miscellaneous

Format: Digital

Additional Information: British Columbia Geological Survey Branch

8. Title: Aggregate Potential Okanagan North

Author: Government of British Columbia

Product No.:

Ministry Reference:

Category: Miscellaneous

Format: Digital

Additional Information: <http://ebony.gov.bc.ca/mapplace/maps/minpot/aggregate.MWF>

9. Title: Aggregate Potential Okanagan South

Author: Government of British Columbia

Product No.:

Ministry Reference:

Category: Miscellaneous

Format: Digital

Additional Information: <http://ebony.gov.bc.ca/mapplace/maps/minpot/aggregate.MWF>

10. Title: Aggregate Potential Okanagan Central

Author: Government of British Columbia

Product No.:

Ministry Reference:

Category: Miscellaneous

Format: Digital

Additional Information: <http://ebony.gov.bc.ca/mapplace/maps/minpot/aggregate.MWF>

11. Title: Surficial Geology and Aggregate Potential Mapping for Northeast British Columbia

Author: Government of British Columbia

Product No.:

Ministry Reference:

Category: Miscellaneous

Format: Digital

Additional Information: Resource Development and Geoscience Branch

12. Title: Sierra/Yoyo/Desan Aggregate Potential Map

Author: Heather Blyth, Victor Levson

Product No.:

Ministry Reference:

Category: Miscellaneous

Format: Digital

Additional Information: British Columbia Ministry Energy and Mines

13. Title: British Columbia: Sample Surficial Geology (Terrain) Map - Muchalat Lake

Author:

Product No.:

Ministry Reference:

Category: Miscellaneous

Format: Digital

Additional Information: British Columbia Ministry Energy and Mines

**Aggregate Policy and Legislation**

14. Title: Land Use Operational Policy – Aggregate and Quarry Materials

Author: Assistant Deputy Minister, Crown Land Administration Division

Product No.:

Ministry Reference: Land Act (Ch. 245 R.S.B.C. 1996), Section 19 & 28 Mines Act (Ch. 293 R.S.B.C. 1996)

Category: Miscellaneous

Format: Digital

Additional Information: Crown Land Administration Division

15. Title: Aggregate Operators Best Management Practices Handbook

Author: Ministry of Energy and Mines (MEM), British Columbia

Product No.:

Ministry Reference: Mines Act (Ch. 293 R.S.B.C. 1996)

Category: Miscellaneous

Format: Digital

Additional Information: Crown Land Administration Division

**Figure 1: BC - Website access to Information on Aggregates**

Ministry Home
Government of British Columbia

**Programs & Services**
Ministry of Energy, Mines and Petroleum Resources

Ministry News
Ministry Search
Reports & Publications
Site Map
Contacts

## Aggregate Project

Contents

[Aggregate Potential Maps](#)  
[Aggregate Downloads](#)  
[Aggregate Forum](#)  
[Aggregate Publications](#)  
[Aggregate Inventory](#)  
[Aggregate Review](#)

Other Links

Aggregate Project  
[Landslides in BC](#)  
[Earthquakes in BC](#)  
[Victoria Earthquake Maps](#)

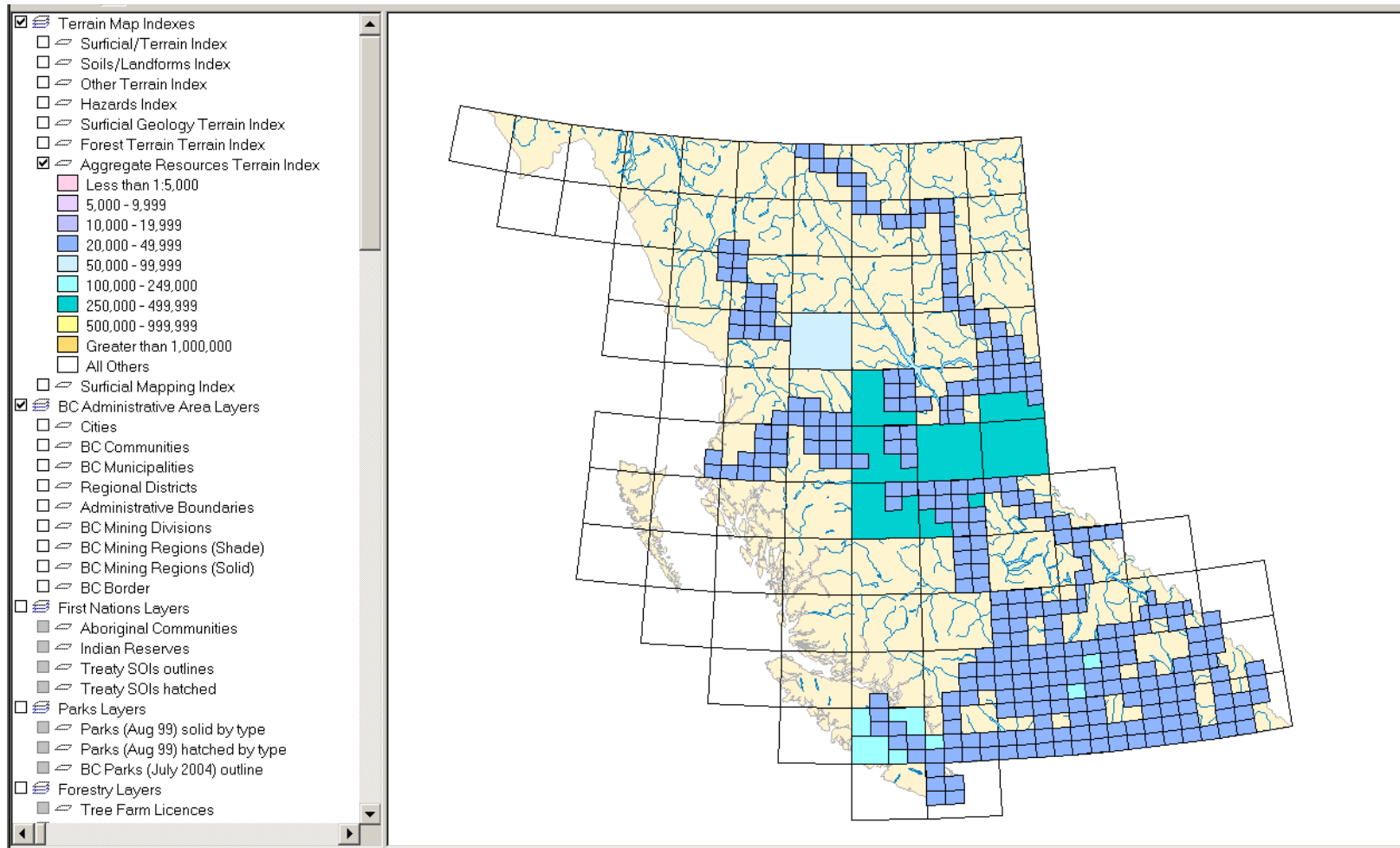


**Aggregate Potential Maps**

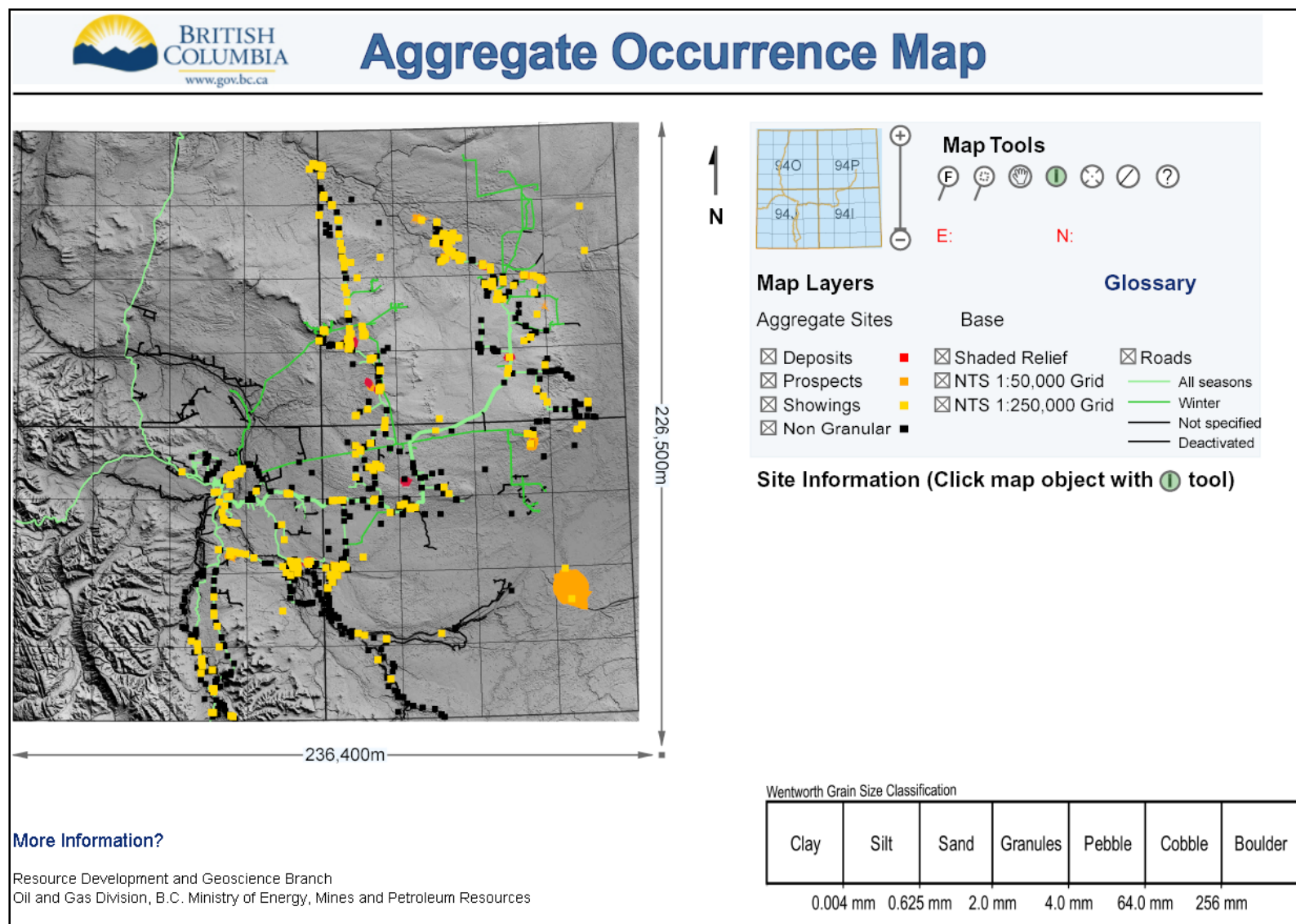
[Lower Mainland Construction Aggregates Demand Study](#)  
[Aggregate Map & Data Downloads](#)  
[Aggregate Maps on The Map Place](#)  
[Aggregate Forum & Related Papers](#)  
[Aggregate Publications](#)  
[Aggregate Inventory](#)  
[Aggregate Operators BMP Handbook](#)  
[Aggregate Metadata](#)  
[Aggregate Review](#)  
[Northeast BC Aggregate Mapping Program with Interactive Aggregate Occurrence Map](#)  
[Application Documents for Aggregate Tenure](#)  
[Mineral Statistics, including Construction Aggregates](#)



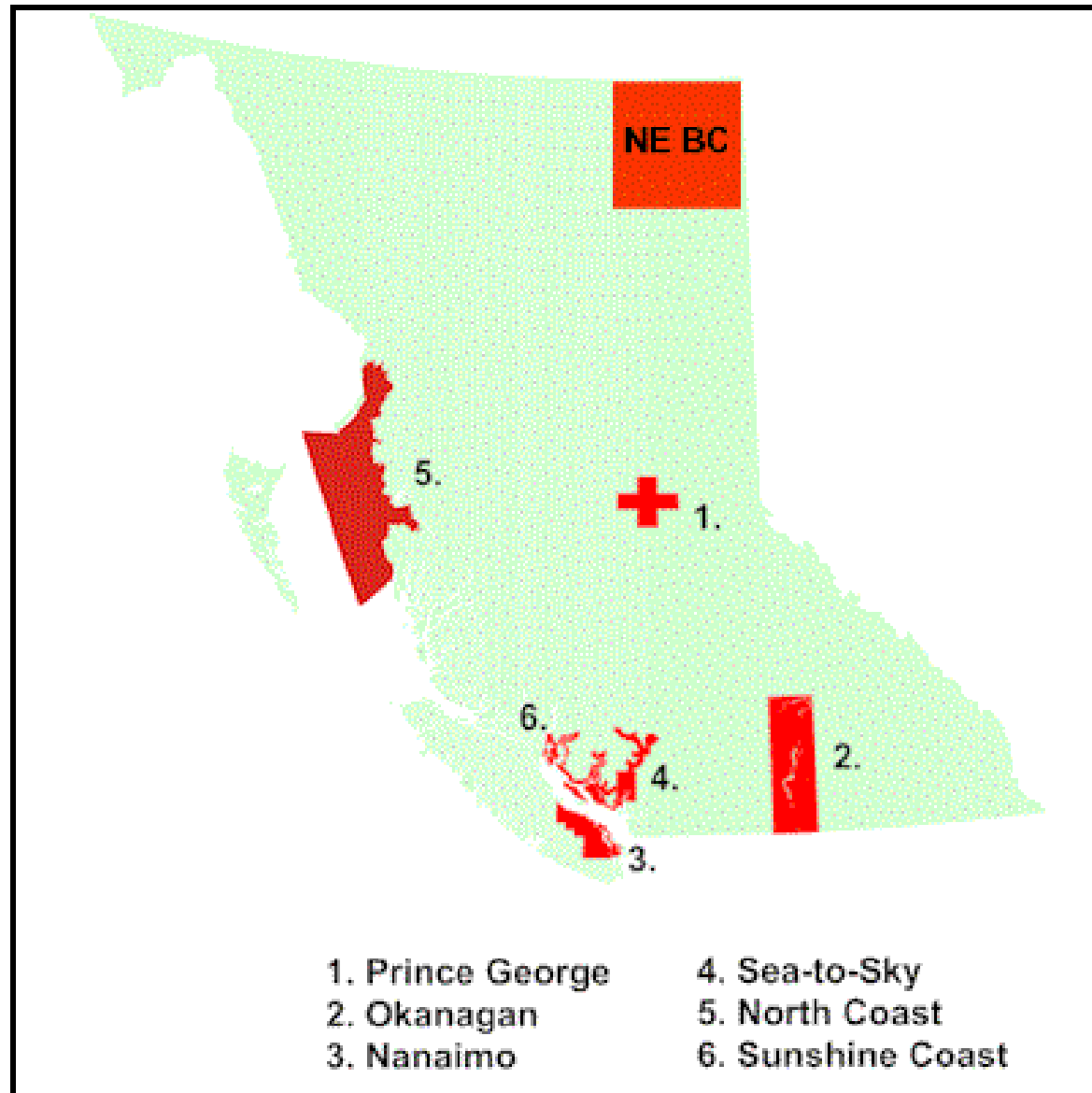
## Figure 2: BC - Terrain Indexes to Aggregate Resources Mapping



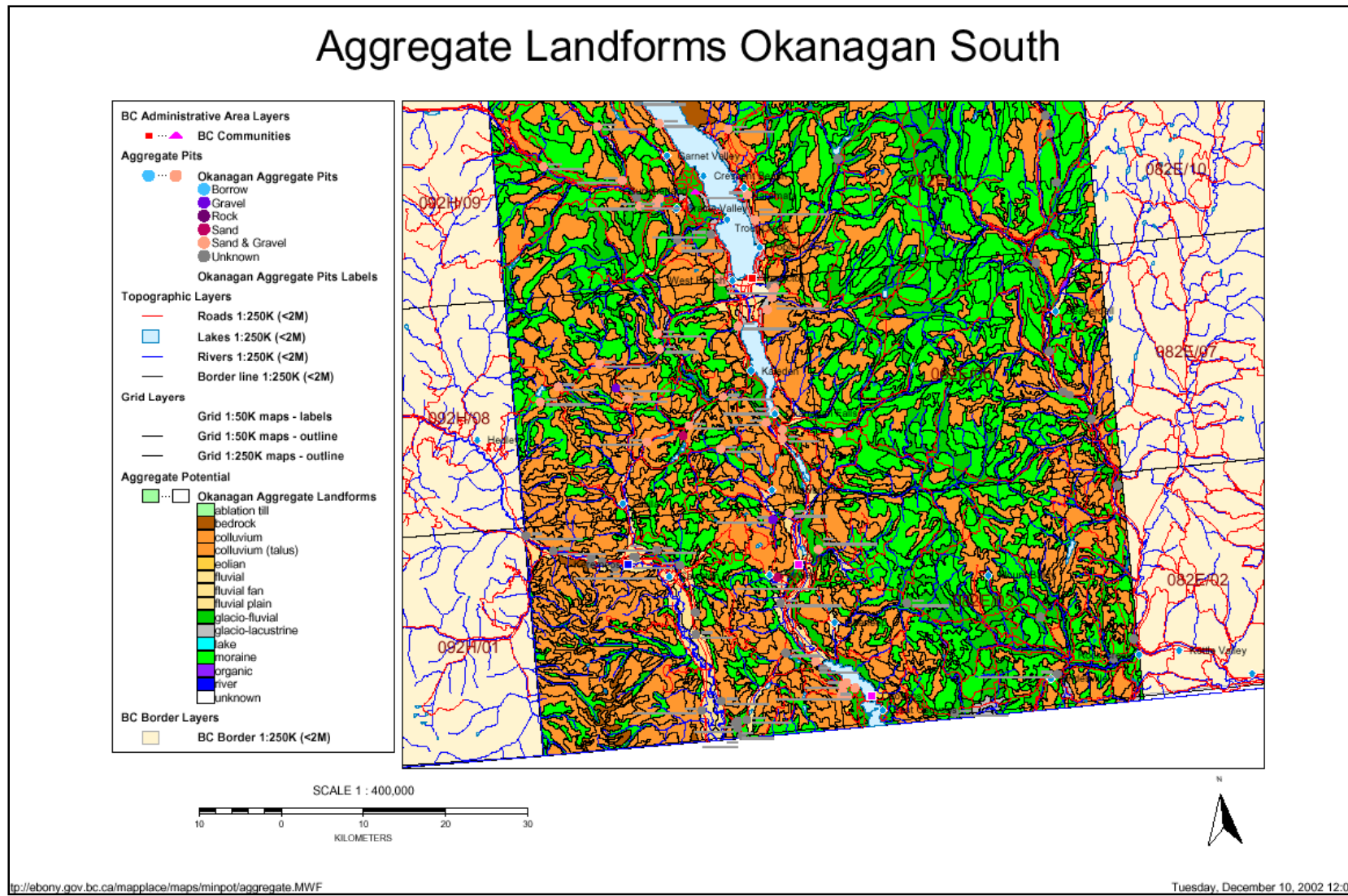
**Figure 3: BC - Website access – Aggregate Occurrences**



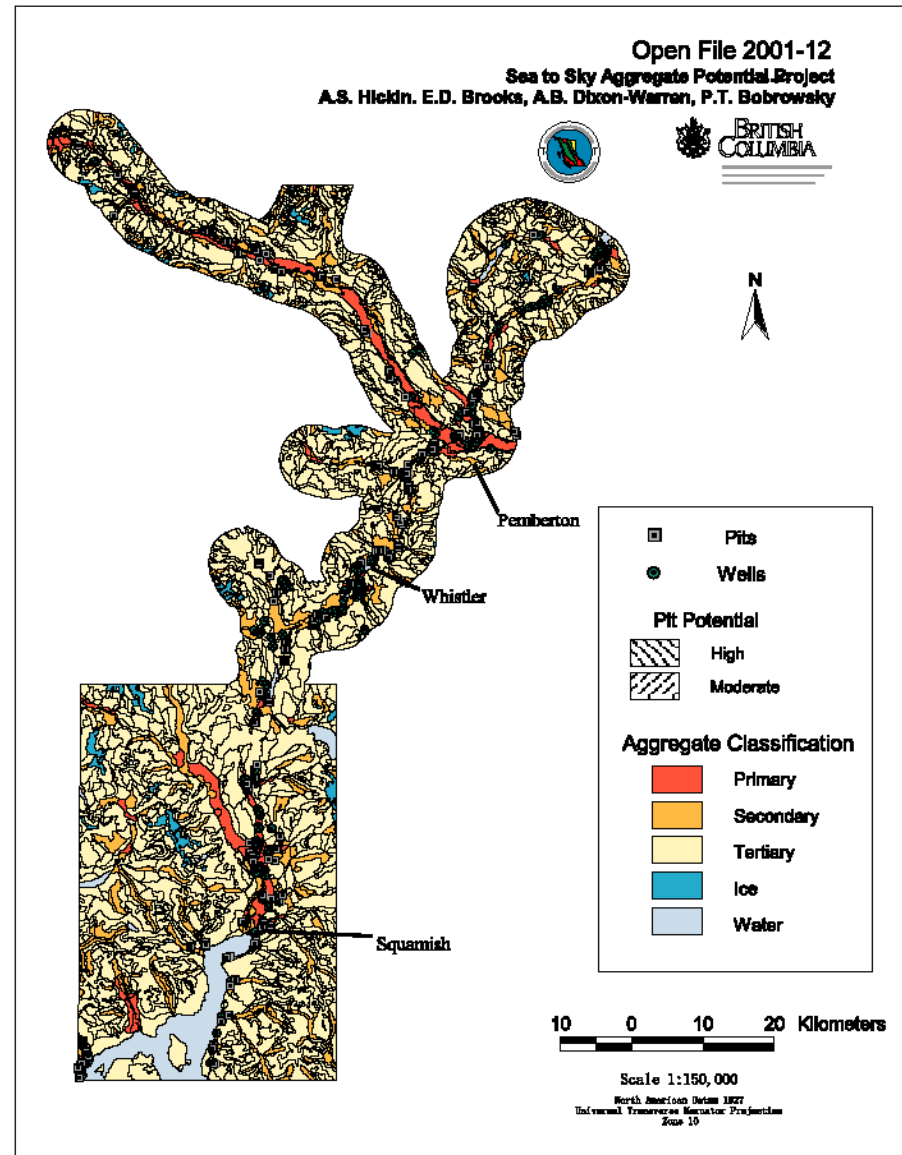
**Figure 4: British Columbia – Aggregate Potential Study Areas**



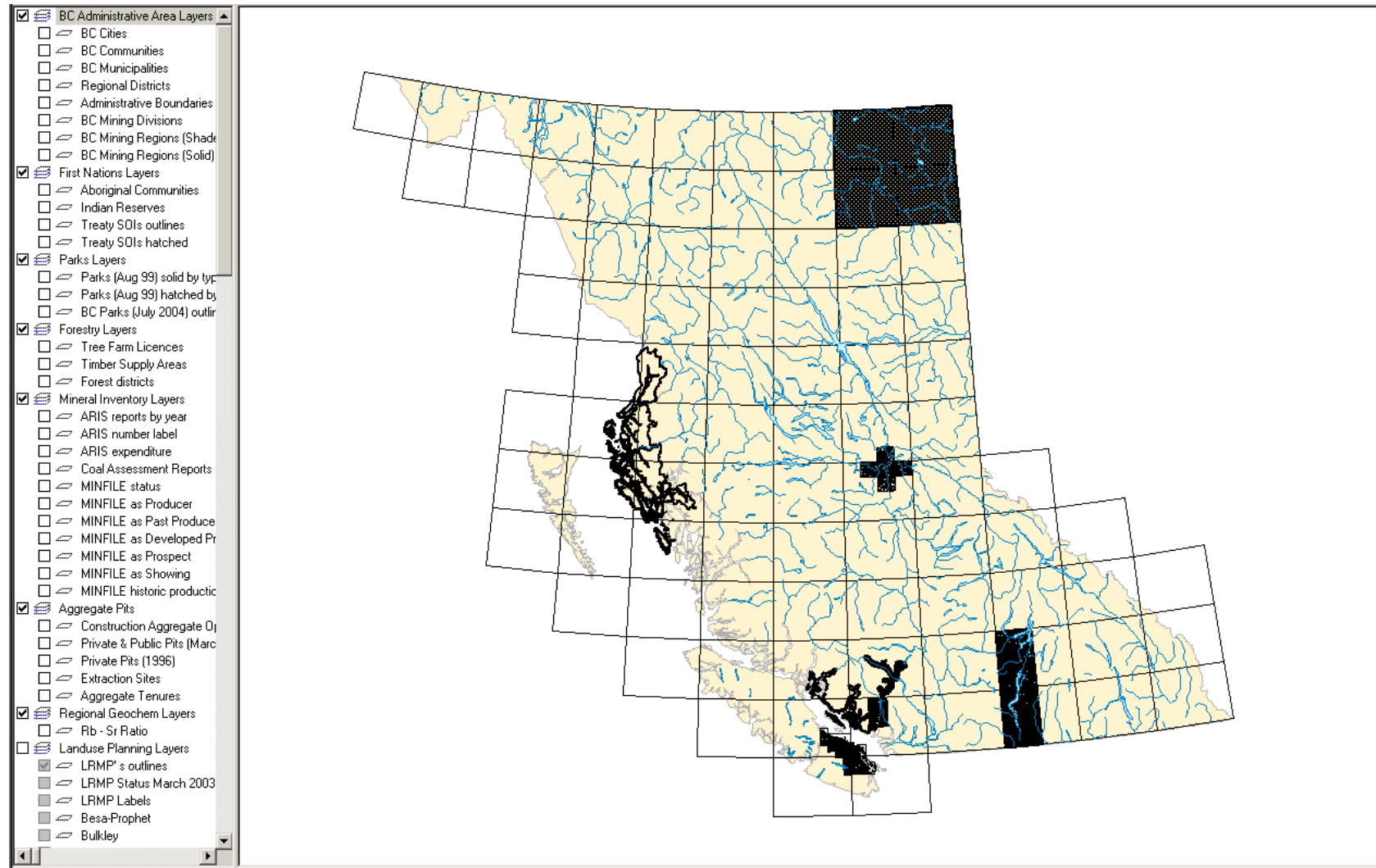
**Figure 5: British Columbia – Okanagan Aggregate Landforms**



**Figure 6: British Columbia – Sea to Sky Aggregate Potential Project**

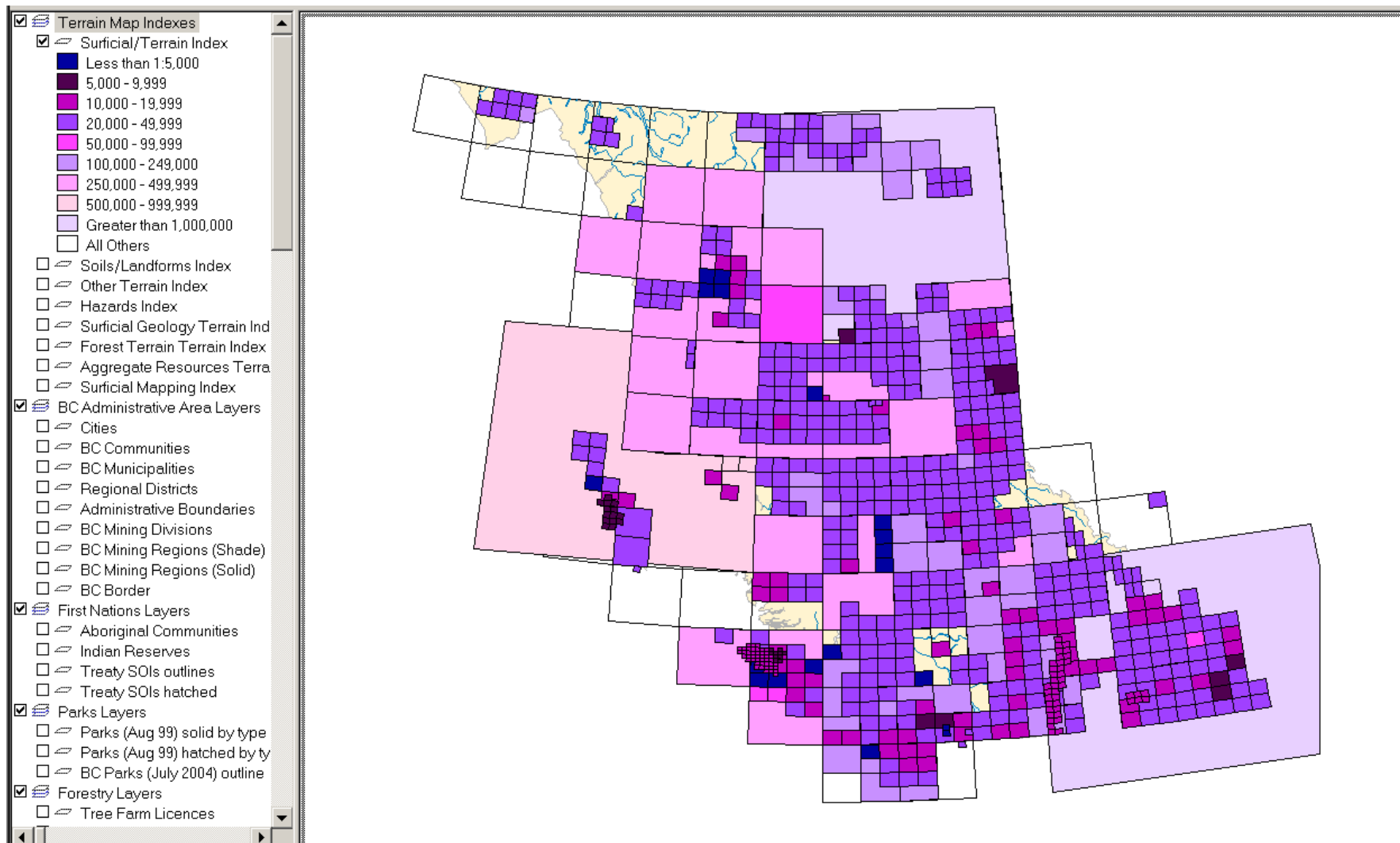


# Figure 7: British Columbia Website – Aggregate Occurrences

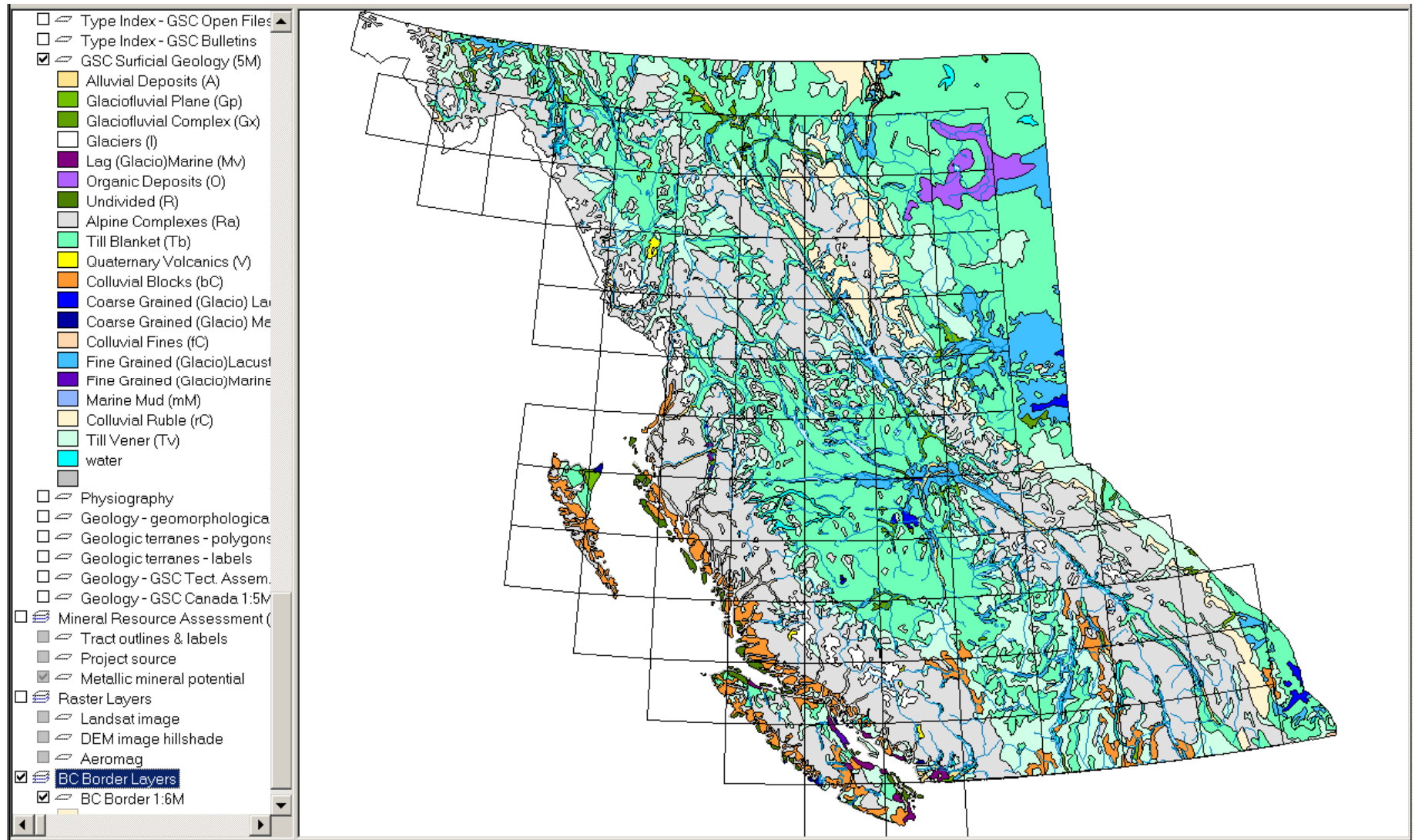




# Figure 8: BC - Online Interactive Index to Surficial Geology Map



**Figure 9: British Columbia Online Interactive Surficial Geology Map**





## 2.0 Alberta Aggregate Resources

### 2.1 Aggregate Ownership

#### Private Land

The ***Law of Property Act*** of Alberta defines the ownership of these minerals (sand, clay, marl and gravel) as belonging to the owner of the surface of land if the material can be obtained by stripping off the overburden or excavating from the surface, or otherwise recovered by surface operations. Refer to the Department of Sustainable Resource Development weblink at:

[http://www.srd.gov.ab.ca/land/fp\\_managing.html](http://www.srd.gov.ab.ca/land/fp_managing.html)

#### Public (Crown) Land

The Province administers extraction activities under the ***Public Lands Act*** and the ***Disposition and Fees Regulations*** as set out in the weblink at:

<http://www.srd.gov.ab.ca/lands/usingpublicland/default.aspx>

These requirements are summarize in two publications:

- “A Guide to “Surface Material” Resource Extraction on Public Land”; and
- “Alberta Aggregate (Sand and Gravel) Allocation Policy for Commercial Use on Public Land”

available for download in pdf format for the weblink at:

<http://www.srd.gov.ab.ca/lands/usingpublicland/surfacematerials.aspx>

### 2.1 Legislation

#### Departmental Responsibility for Aggregates

Land and Forest Service and Public Lands Division of the Department of Alberta Sustainable Resource Development (ASRD) promotes the development of surface materials based on the following principles:

- Orderly and efficient resource management through proper resource evaluation, planning, allocation and appropriate use of the surface material resources; and
- Environmental protection as an integral part in the planning and development of the surface material resources.

#### Permitting and Licensing

***Mines and Minerals Act*** - defines sand, clay, marl, and gravel as minerals.

***The Law of Property Act*** - defines the ownership of these minerals (sand, clay, marl and gravel) as belonging to the owner of the surface of land if the material can be obtained by

stripping off the overburden or excavating from the surface, or otherwise recovered by surface operations.

**The *Public Lands Act*** - authorizes and regulates the allocation and use of public land.

**The *Disposition and Fees Regulations*** - authorizes extraction of Surface Materials (silt, clay, marl, sand and gravel) on public land, through the issuance of Surface Material Licences (includes Public Pit Licences), Surface Material Leases, and Disposition Reservations (for government agencies).

**The *Environmental Protection and Enhancement Act (EPEA)*** - makes pits on public land subject to conservation and reclamation requirements. The *Act* gives authority to the Minister to delegate reclamation certification duties to Conservation & Reclamation Inspectors. The officers under the *Public Lands Act* have been designated as Inspectors under EPEA and issue reclamation certificates. Pits on private lands that are less than 5ha in size are exempt from the EPEA however they must follow the *Environmental Protection Guidelines for Pits*.

**Activities Designation Regulations** – excludes surface material extraction operations on public land from the requirement to obtain an approval under EPEA. Approval, for any size of operation on public land, is obtained through the *Public Lands Act*.

**Conservation and Reclamation Regulation** – allows the specification of reclamation standards. Describes the inquiry process for issuing reclamation certificates. Identifies how Environment Orders are used to ensure compliance with EPEA and the Regulation.

In all cases, when it comes time to certify the reclamation work on the site, the Inspector (land manager) must look to the definitions in the **Conservation and Reclamation Regulation** to determine what kind of activity has been conducted and therefore what the certification requirements.

A Conservation and Reclamation Information Letter (C&R/IL/98-2 March, 1998) provides guidance and clarifies the application of the *Environmental Protection and Enhancement Act* (EPEA) to pits located on private and public lands.

Excerpts from weblink (<http://www.environment.gov.ab.ca/info/library/6878.pdf>)

This Information Letter applies to pits (sand, gravel, clay, and marl). It clarifies how Alberta environmental Protection interprets the term “operating a pit” under the *Environmental Protection and Enhancement Act* (EPEA) and its Regulations.

#### **Private Land Pits**

EPEA requires an operator to obtain an approval before starting pit operations, which will create a surface disturbance exceeding 5 hectares (12.5 acres). Operators of pits creating less than 5 hectares of surface disturbance on private land do not require an EPEA approval. However, they must follow the *Environmental Protection Guidelines for Pits* (Conservation and Reclamation Information Letter 96-5). regulations, and other applicable Acts such as the *Public Lands Act* and the *Water Resources Act*.

#### **Public Land Pits**

Pits on public land do not require an EPEA approval, but they do require a licence or lease under the *Public Lands Act*. Pits on public land must also follow the *Environmental Protection Guidelines*, and terms and conditions of their lease or licence. Where there is a difference between the *Environmental Protection Guidelines* and a licence or lease, the licence or lease takes precedence.

### **2.3 Granular Resource Inventories**

The Alberta Geological Survey within the Energy and Utilities Services Board has the responsibility for aggregate resource identification and resource assessments. Mapping the aggregate (sand and gravel) surveys cover the majority of the province.

#### **Sand and Gravel Inventory**

The sand and gravel data for the areas cross-hatched in orange (Figure 1) has been compiled into digital format, whereas the data for the green cross-hatched area is available in hard copy only. The grey areas have not been mapped. Selecting a specific map sheet produces a map displaying the location of the aggregate resources. E.g. Map Sheet 83H (Edmonton) provides zoomed in view of the map of the aggregate deposits (Figure 2).

Selecting one of the deposits with the cursor (e.g. deposit NE of Edmonton) produces an enlargement of the deposit area as well as a description of the study and information on the deposit including area, volume and sand/gravel content (Figure 3).

An interactive resources calculator and report references are also included in this module (not shown) that allows the user to recalculate estimated volumes based on user estimates (e.g. of deposit thickness).

### **2.4 Public Access and Availability to Data**

The survey's website (<http://www.ags.gov.ab.ca>) provides a link to the various geological resource assessments at weblink:

[http://www.ags.gov.ab.ca/GIS/gis\\_and\\_mapping.shtml](http://www.ags.gov.ab.ca/GIS/gis_and_mapping.shtml) .

Access to geological mapping is provided through the weblink to “Geology of Alberta”. These interactive geological maps of Alberta permit browse and data query as well as the download of the GIS data as set out on Figure 4.

#### **Sand and Gravel**

Queries of a specific topic will direct the user to the appropriate section, for example the “Sand and Gravel” link on Figure 4 (Edmonton) will lead to a map of the province where the mapping has been completed (Figure 1). The aggregate data in digital format can be queried online or downloaded in GIS format.

## **Surficial Geology**

Selecting the “Geology of Alberta” weblink on Figure 4 will lead you to an interactive Geology map of Alberta. Deselecting the Bedrock Geology and selection of Surficial Geology in the interactive “Query Layer” of the geological information screen provides an index map of surficial geology (Figure 5). Figure 6 is a compilation for southern Alberta east of the Rocky Mountains. Selecting an NTS map sheet (e.g. NTS 83H – Edmonton) and zooming in provides further detailed information on the surficial geology (Figure 7).

## **Bedrock Geology**

Selection of “Geology of Alberta” (first level, Figure 4) and selection of bedrock geology, lakes and rivers and NTS grid in the Query Layer control will display the bedrock geology of Alberta as shown on Figure 8. Use of the zoom tool provides for an enlargement of the pictorial picture, but unlike the surficial geology module, does not lead to more detailed mapping or other information on the bedrock geology.

## **2.5 Reports/Publications**

A complete listing of references is available by selecting “Publications” on the website at weblink:

[http://www.ags.gov.ab.ca/publications/publications\\_alberta\\_geological\\_survey.shtml](http://www.ags.gov.ab.ca/publications/publications_alberta_geological_survey.shtml)

Selection of “AGS Activities & Programs” in the upper left hand corner goes to weblink

<http://www.ags.gov.ab.ca/default.shtml>

Selection of “Surficial Mapping” in the left hand side of the window transfer to weblink:

[http://www.ags.gov.ab.ca/activities/surficial\\_mapping/surficial\\_mapping.html](http://www.ags.gov.ab.ca/activities/surficial_mapping/surficial_mapping.html)

an index map of Surficial mapping Figure 8. Select publications for a complete listing of reports surficial mapping publications

A complete listing of Map NTS sheets of resource studies for aggregate sand and gravel plus applicable surficial mapping is available through weblink:

[http://www.ags.gov.ab.ca/activities/minerals/northern\\_resource.html](http://www.ags.gov.ab.ca/activities/minerals/northern_resource.html)

. Some of these data are available for free by downloading the report in “pdf” format or as GIS data. Ordering by CD or in hardcopy can be done on-line with payment by credit card.

## **2.6 References**

### **Aggregate Resource and Surficial Geology Maps and Reports**

1. Title: Aggregate resources maps, NTS 82J

Open File #1986-17

Author: Shetsen, I.

Product No.:

Ministry Reference:

Category: Miscellaneous

Format: Soft Cover

Additional Information: Alberta Research Council

2. Title: Sand and Gravel Resources of the Pelican (West Central Portion of 83P) Map Area, Alberta

Open File #1987-02

Author: Scafe, D.W.; Sham, P.C.; Ray, C.M.

Product No.:

Ministry Reference:

Category: Miscellaneous

Format: Soft Cover

Additional Information: Alberta Research Council

3. Title: Sand and Gravel Resources of the Chinchaga River (South Half of 84E) Map Area, Alberta

Open File #1988-15

Author: Scafe, D.W.; Edwards, W.A.D.; Boisvert, D.R.

Product No.:

Ministry Reference:

Category: Miscellaneous/Alberta Geological Survey

Format: Soft Cover

Additional Information: Alberta Research Council

4. Title: Sand and Gravel Resources of the Peace River Area

Open File #1991-21

Author: Scafe, D.W.; Edwards, W.A.D.; Boisvert, D.R.

Product No.:

Ministry Reference:

Category: Miscellaneous/Alberta Geological Survey

Format: Soft Cover

Additional Information: Alberta Research Council

5. Title: Sand and Gravel Resources of the Athabasca Area, Alberta Edwards, W.A.D.; Boisvert, D.R.; Pawlowicz, J.G.; Fenton, M.M.

Open File #1991-22

Author: W.A.D.; Boisvert, D.R.; Pawlowicz, J.G.; Fenton, M.M.

Product No.:

Ministry Reference:

Category: Miscellaneous

Format: Soft Cover

Additional Information: Alberta Research Council

6. Title: Mapping and Resource Evaluation of the Tertiary and Preglacial Sand and Gravel Formations of Alberta

Open File #1994-06

Author: Edwards, D.; Scafe, D

Product No.:

Ministry Reference:

Category: Miscellaneous/Alberta Geological Survey

Format: Soft Cover

Additional Information: Alberta Research Council

7. Title: Surficial Mapping & Granular Aggregate Resource Assessment in Northwest Alberta, in Summary of Activities 2005

Author: Rod Smith, Roger Paulen, Alain Plouffe, Chris Kowalchuk, Ryan Peterson

### **Aggregate Policy and Legislation**

8. Title: Environmental Protection Guidelines for Pits Conservation and Reclamation

INFORMATION LETTER

November 1996 C&R/IL/96-5

9. Title: Conservation and Reclamation Information Letter Operating A Pit

March, 1998 C&R/IL/98-2

10. Title: A Guide to the Code of Practice for Pits, October 2004

Author: Alberta Environment, Edmonton, Alberta. 84 pp

Product No.: ISBN (printed): 0-7785-3764-1

ISBN (on-line): 0-785-3765-X

Pub No.: T/763

11. Title: Alberta Aggregate (Sand & Gravel), March 1,2006  
Allocation Policy for Commercial Use on Public Land

12. Title: A Guide to “Surface Material” Resource Extraction on Public Land

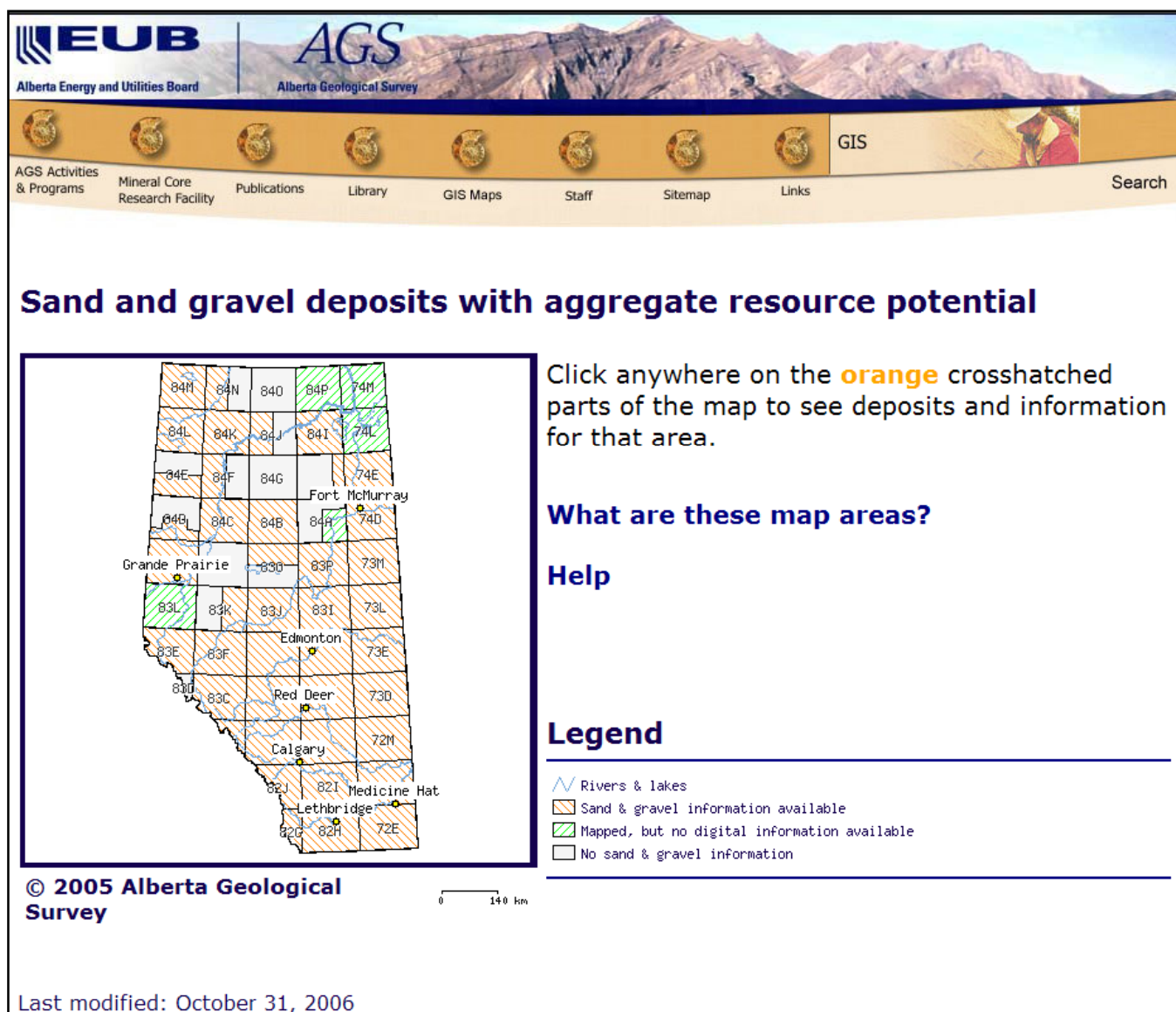
NOTE: This Guide supercedes “Sifting Through Sand and Gravel” and those portions of “Guide for Pits” that refer to public land.

For updates to this publication refer to any ASRD office or from the hyperlink "Public Land Administration" ASRD's website @

<http://www.gov.ab.ca/env/land.html>

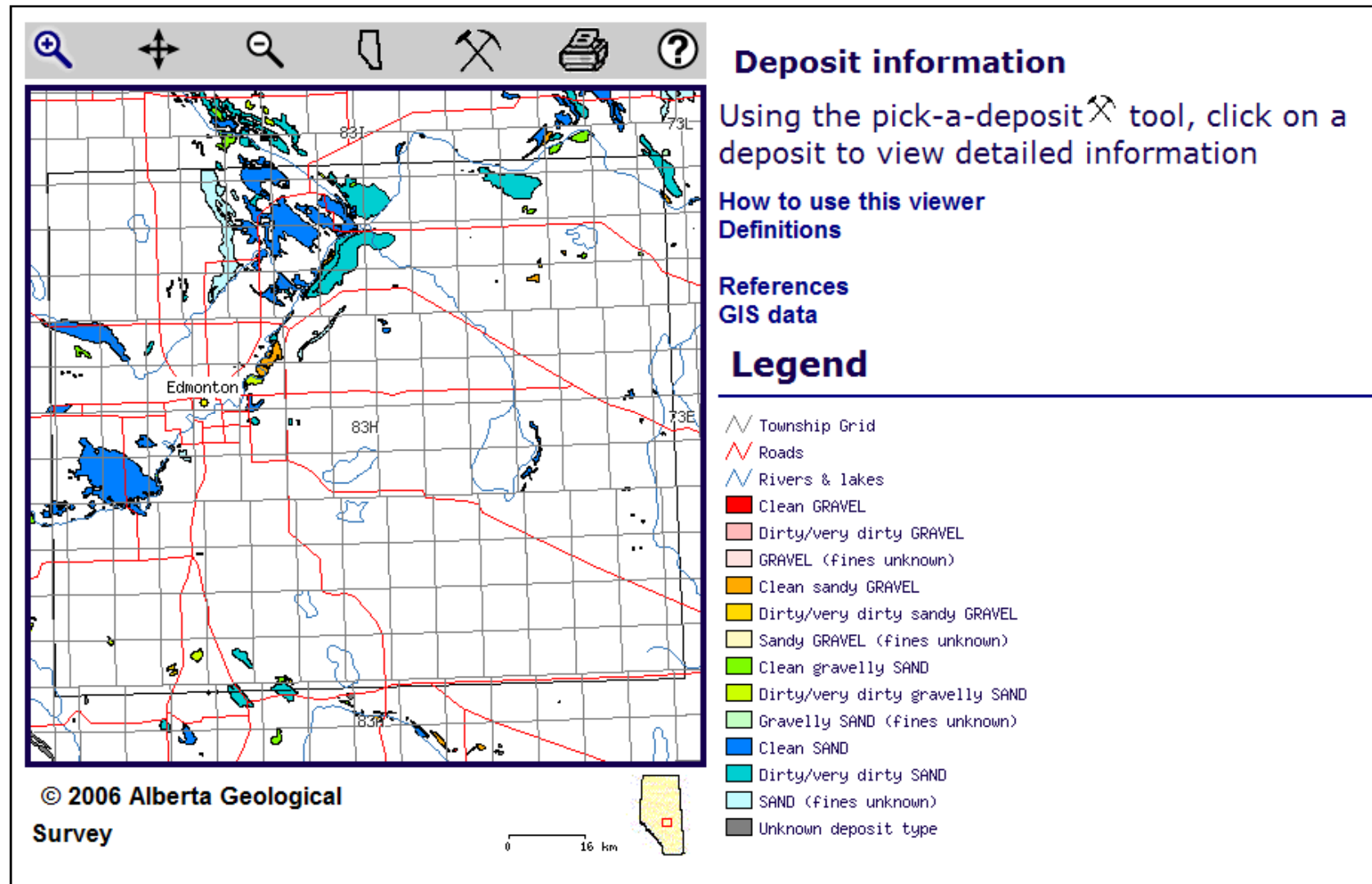
ISBN No. 0-7785-1395-5

**Figure 1: Sand and gravel deposits with aggregate resource potential**





**Figure 2: Aggregate Deposit Information Edmonton Area (NTS 83H)**



**Figure 3: Detailed Deposit Information Edmonton Area (NTS 83H)**

**Properties of AGS Deposit Number: 6199**

**Study level:** Sand and/or gravel with resource potential were confirmed in this deposit by Alberta Geological Survey site investigation and limited sampling and/or testing.

**Material description:** clean sandy GRAVEL

**NTS area:** 83H

**Area (ha):** 1056

**Gravel content (%):** 67

**Sand content (%):** 32

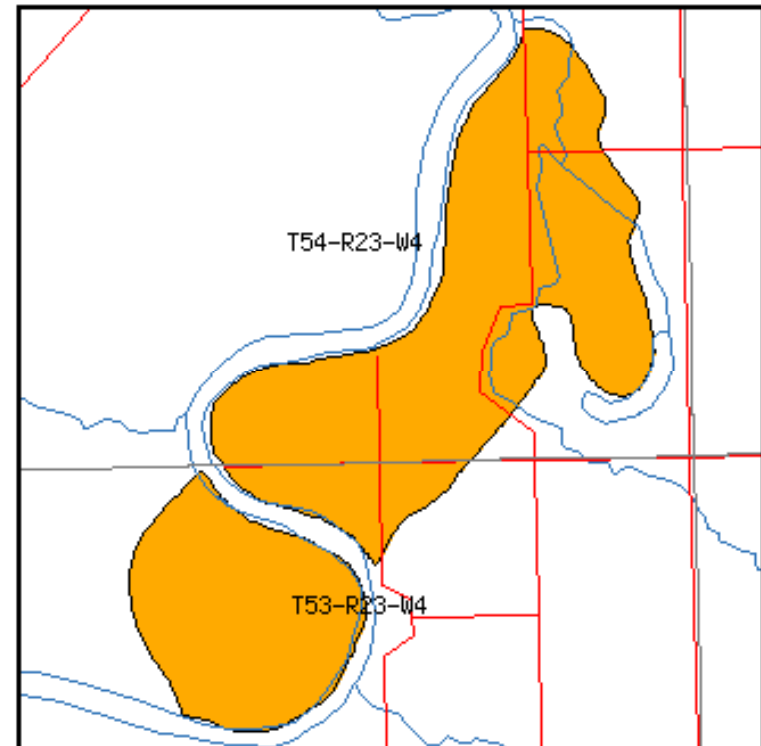
**Thickness (m):** 5.0

**Gravel volume ('000s m<sup>3</sup>):** 24500

**Sand volume ('000s m<sup>3</sup>):** 12000

**Total volume, sand and gravel ('000s m<sup>3</sup>):** 36500

Note: blank values signify unknown or insufficient data for resource calculation



## Figure 4: Alberta GIS and Interactive Maps

**ATS Conversion Tools**  
**GIS FAQs**  
**Tips for Using the Interactive Maps**  
**Download GIS Datasets**  
**Alberta Township System**  
**External Website**  
**Alberta Travel Maps**  
**Alberta Energy Maps**

### Alberta GIS and Interactive Maps


These interactive geological maps of Alberta will let you browse, query and download GIS data.


You can pan and zoom, click on features for more information and follow hyperlinks. Linked information includes core photos, thin section photomicrographs, drillhole logs, printable maps, GIS files (datasets) and related AGS geology reports and maps.


Additional tools are listed on the right side of the maps. You may need to scroll across depending on your screen resolution.


⑦ Help using each section is available by clicking on the map's Help icon for that section.

**NOTE:** These GIS maps are designed for Internet Explorer 5 and higher at 1024x768 resolution. Mozilla Firefox and Netscape 7.2 will render most of the pages correctly. The GIS components do not work with earlier versions of Netscape.

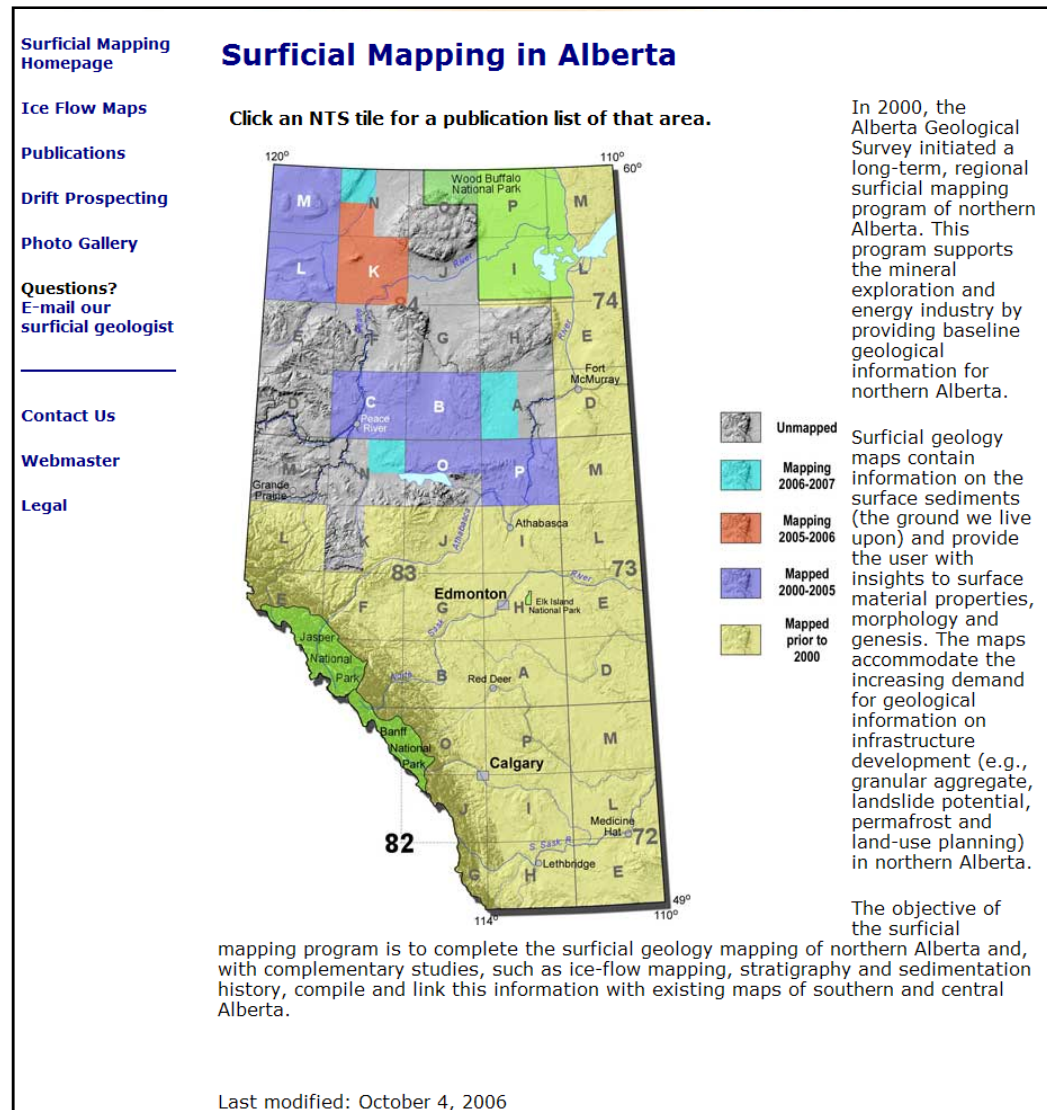
**Geology of Alberta**  
Updated Dec 1, 2005

**Hydrogeology/Water Well Chemistry**

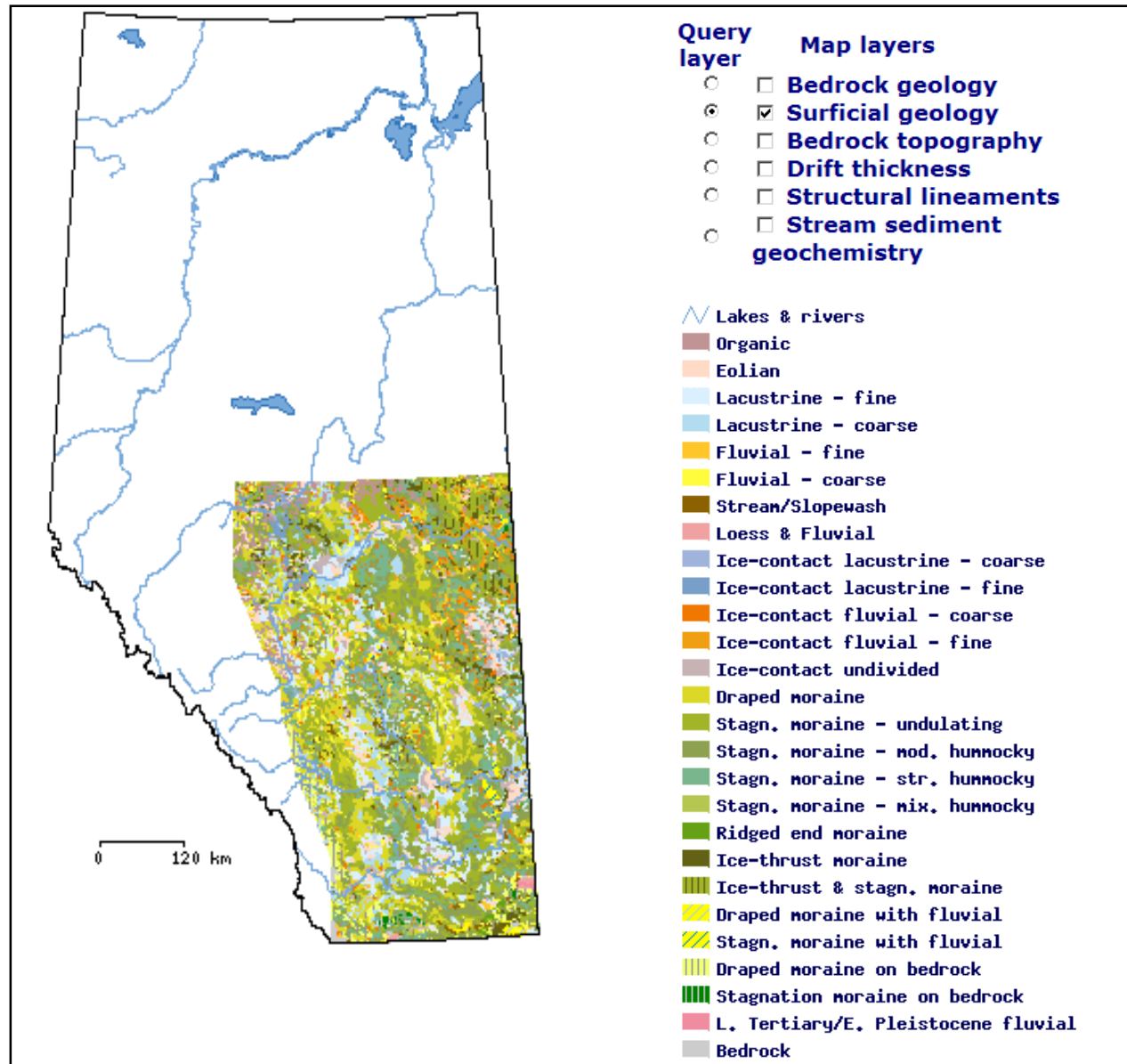
**RadarSat-1 Data Holdings**

**Sand and Gravel**

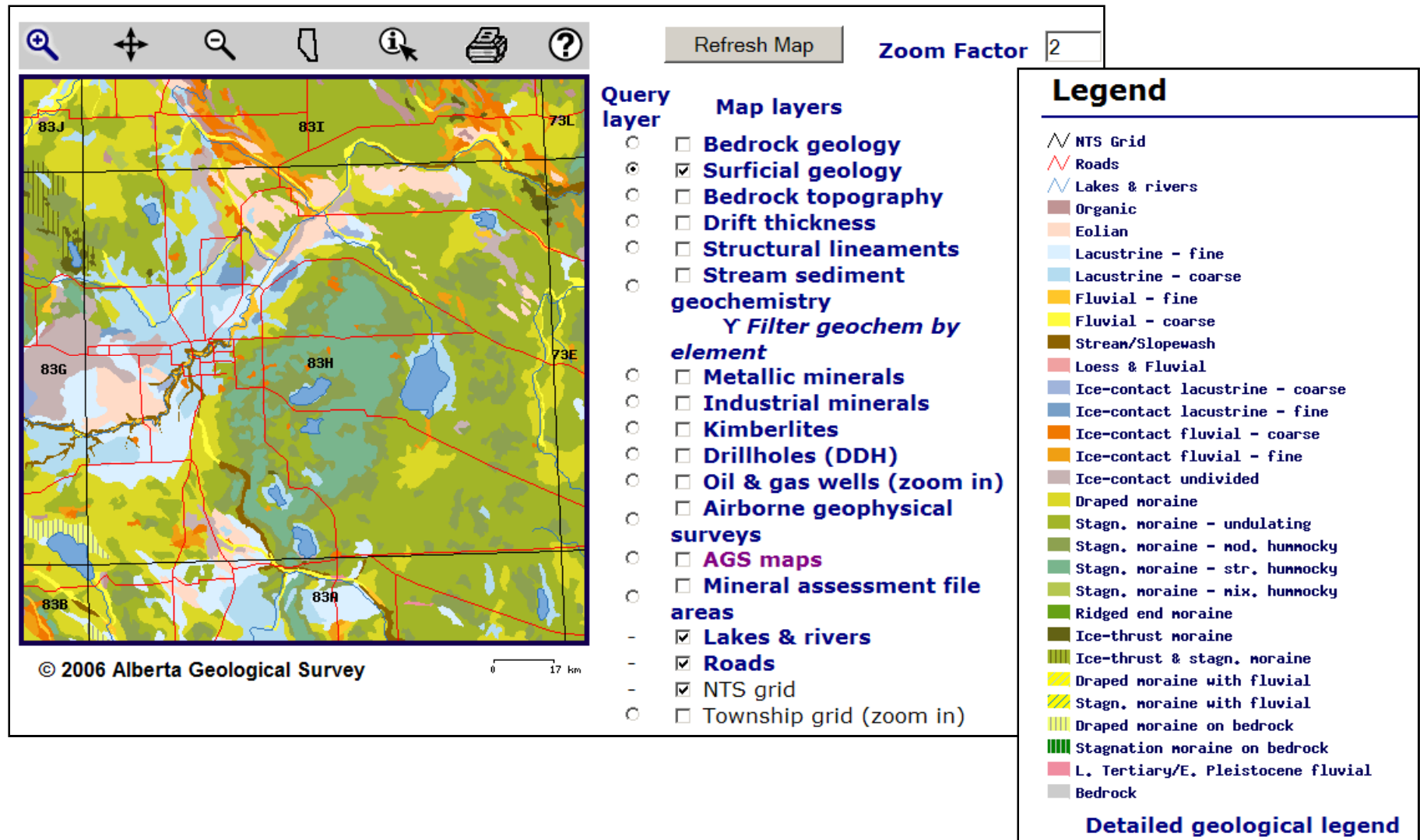
## Figure 5: Alberta – Surficial Mapping Report Index



**Figure 6: Alberta – Interactive Map of Surficial Geology Features**

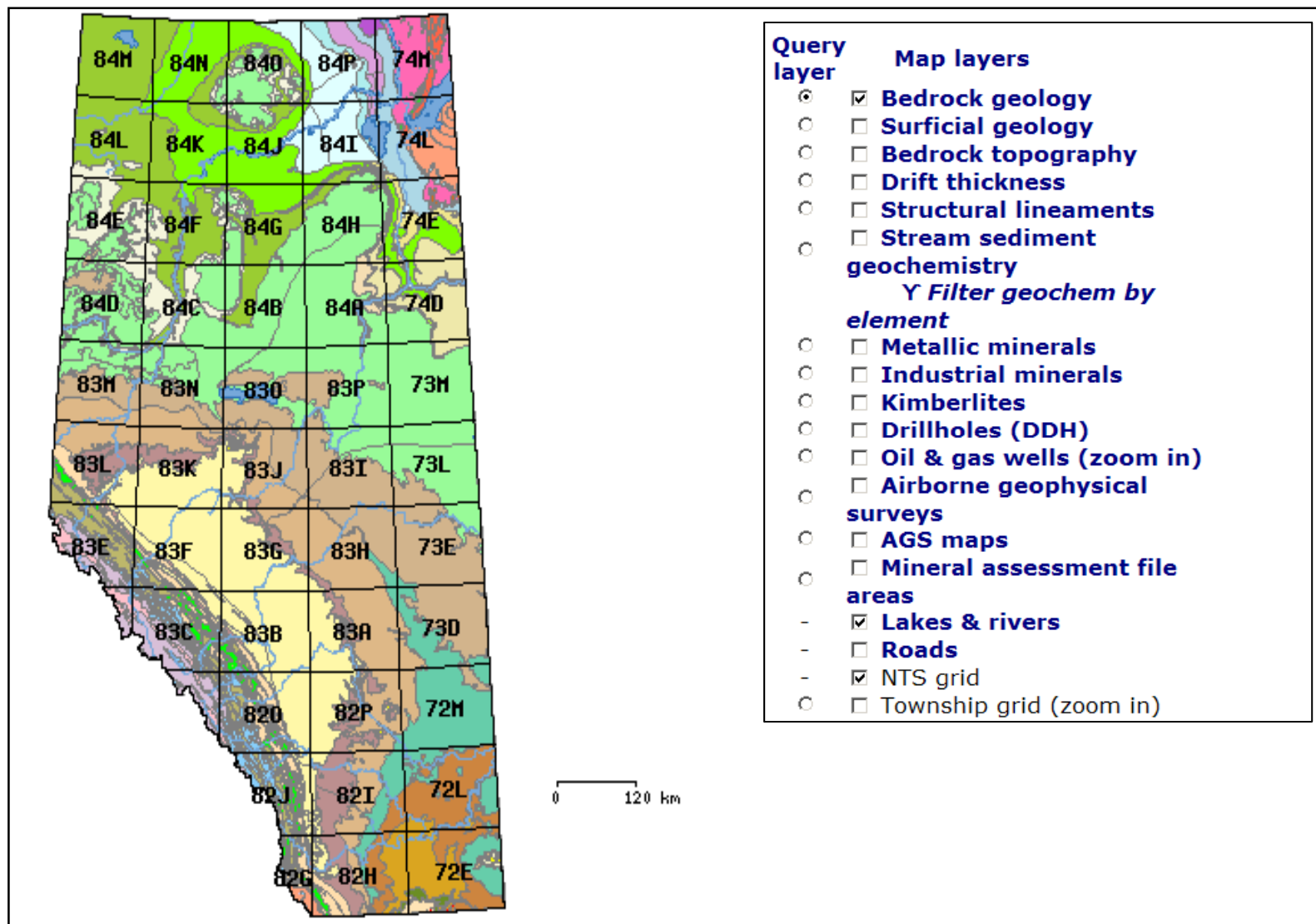


**Figure 7: Detailed View of Interactive Map of Surficial Geology Features**





**Figure 8: Alberta - Interactive Map of Bedrock Geology**



## 3.0 Saskatchewan Aggregate Resources

### 3.1 Aggregates Ownership

#### **Private Land**

In Saskatchewan, Sand and Gravel is owned by the property owner under the *Sand and Gravel Act: Chapter S-5* of the Revised Statutes of Saskatchewan, 1978, (effective February 26, 1979). This Act applies to all lands in the province and to the owners, including the Crown and the lands owned by the Crown in right of Saskatchewan.

Sand and gravel on the surface or that which can be obtained by surface operations belongs to the owner of the surface who is entitled to all sand and gravel on the surface of the land and all sand and gravel obtainable by stripping off the overburden, excavating from the surface or other surface operation.

#### **Crown Land**

Quarriable substances (quarry materials) on Crown Land, including sand, gravel and bedrock are reserved to the Crown

### 3.2 Legislation

A copy of the legislation can be accessed at weblink:

<http://www.qp.gov.sk.ca/documents/English/Statutes/Statutes/S5.pdf>

Under the *Sand and Gravel Act: Chapter S-5*, sand and gravel on the surface obtainable by surface operations, is part of surface: shall not be deemed to be a mine, mineral or valuable stone but shall be deemed to be and to have always been a part of the surface of the land and to belong to the owner thereof.

The owner of any mines, minerals, or valuable stone within, upon or under any land is not entitled to the sand and gravel rights except where the ownership includes the surface of the land.

#### **Crown Land**

The *Quarrying Regulations Act, 1957* are administered by the Minister of Mineral Resources, and govern the disposal of quarriable substances (quarry materials) on Crown Land, including sand, gravel and bedrock.

“Quarriable Substance” means:

any mineral substance, that is the property of the Crown, which can be quarried and includes: bentonite, building stone, clay, granite, gravel, gypsum, limestone, marble, marl, sand, slate, volcanic ash, and any other substance declared to be a quarriable substance under these regulations.



**“Quarry”** means:

any open pit or excavation made for the purpose of moving any quarriable substance and includes all works etc. below or above ground used in connection with the operation.

**“Prospecting Permits”** allows exploration and prospecting for quarriable substances for an area of < 25 square miles on land where the quarriable substances are Crown property but does not authorize the permittee to remove any substance from such area except that which is required to determine whether the area contains any quarriable substance in commercial quantities.

**“Quarry Lease”** by quarter section, legal subdivision or fraction thereof for not more than twenty-one years may be granted by the Minister (also renewable for an additional 21 years).

### **3.3 Granular Resource Inventories**

The Government of Saskatchewan website has a search page for publications (Figure 1), which allows the user to search for publications available for purchase, or in some cases download in PDF format. This search page revealed only one aggregate related report. The report was actually a single page summary of an aggregate exploration program carried out by the Saskatchewan Research Council (SRC) in 1988.

The exploration program involved auger drilling, back hoe trenching, sampling and geophysical surveys. The report references an office compilation component consisting of airphoto interpretation and compilation of available sand and gravel information including well records, soil maps, surficial geology maps and testhole information available from Saskatchewan Highways and Transportation. Information derived from the exploration program was to be presented on maps with accompanying reports. Further information on this exploration program was not located.

The website also has a reference to the Surficial Geology mapping program that provides complete coverage of the province from both 1:1,000,000 and 1:250,000 mapping scales.

### **3.4 Public Access and Availability to Data**

The **Geological Atlas of Saskatchewan** is available for purchase on CD-ROM from the Publications office or for viewing and download from their map server website [link](#) (Figure 2). The atlas provides an overview geological information and access to several geoscience datasets in a Geographic Information System (GIS) format.

<http://www.ir.gov.sk.ca/Default.aspx?DN=3482,3385,2936,Documents>

The Surficial Geology selection provides a map view based on 1:1,000,000 and 1:250,000 scale of mapping for the whole province (Figure 3). Identification of aggregate resources requires knowledge of surficial geological mapping and interpretation/deciphering of the short-form geological codes used in the legend. For example most commercial aggregate deposits will occur in unconsolidated materials associated with Glaciofluvial deposits labeled as “GF” on the surficial geology maps.

### **3.5 Reports/Publications**

The reports from the SRC do not seem to be available from the Government of Saskatchewan website which does not make any detectable mention of aggregate or sand and gravel resources.

The Geological Atlas of Saskatchewan can actually be viewed interactively online. Both surface (Figure 3) and bedrock geology (Figure 4) can be seen and selected. There does not appear to be any reference or link to sand and gravel resources. Contact with the Department of Highways resulted in a circular referral to SRC website.

### **3.6 References**

#### **Aggregate Resource and Surficial Geology Maps and Reports**

1. Title: Surficial Geology and Drift Composition of the Annabel Lake-Amisk Lake area, Saskatchewan

Open File #3026

Author: Henderson,P.J.

Product No.: ID: 7079

Ministry Reference:

Category: Miscellaneous/Alberta Geological Survey

Format: 202 pages, diskette with 9 appendices in ASCII format.; 1995

2. Title: The Geological Atlas of Saskatchewan

Category: Miscellaneous

Format: GIS Digital

Additional Information:

This is available for purchase on CD-ROM from the Publications office or for viewing and download from their map server website **link** (Figure 2). The atlas provides an overview geological information and access to several geoscience datasets in a Geographic Information System (GIS) format.

3. Title: Aggregate Exploration Program at the Saskatchewan Research Council; in Summary of Investigations 1988, Saskatchewan Geological Survey, Saskatchewan Energy and Mines

Author: MA Simpson

Product No. : Miscellaneous Paper 88-4

4. Mineral Resource Map of Saskatchewan, 2006 Edition

Author: Saskatchewan Industry and Resources

Information: Location of Building Materials including granite, marble, dolomite and limestone for cement

### **Aggregate Policy and Legislation**

5. Title: Information on Ordering Reports Online

Author: Saskatchewan Industry and Resources

Geo-Publications

200 - 2101 Scarth Street, Regina, SK

S4P2H9, Canada

Tel. (306) 787-2528

Fax. (306) 787-2488

Web Site. <http://www.ir.gov.sk.ca/>

6. Title: Mineral Exploration Guidelines For Saskatchewan

Author: Saskatchewan Mineral Exploration and Government Advisory Committee

Format: Digital

7. Title: The Sand and Gravel Act, Chapter S-5, An Act respecting Sand and Gravel and Certain other Minerals, Revised Statutes of Saskatchewan, 1979

Author:

8. Title: The Quarrying Regulations, 1957, Saskatchewan Regulations 553/67 (effective April 2, 1957) as amended by Saskatchewan Regulations 554/67, 211/69, 166/71, 51/87, 55/88 and 90/92; Regulation under the Mineral Resources Act governing disposal of Quarriable substances, the property of the Crown.

Author: Department of Mineral Resources.

Figure 1: Saskatchewan Publication Search Page

Government of Saskatchewan - Publications Centre - Industry and Resources - Microsoft Internet Explorer

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On-line PDF document: Revised Deeper Rights Reversion Lease Continuance Levels effective April 1, 2004.
- [Isopach Map of the Lower Watrous Red Beds \(Map LW-S\)](#)  
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Internet

Figure 2: Saskatchewan Geological Atlas of Saskatchewan



Figure 3: Online Interactive Geological Atlas of Saskatchewan – Surficial Geology

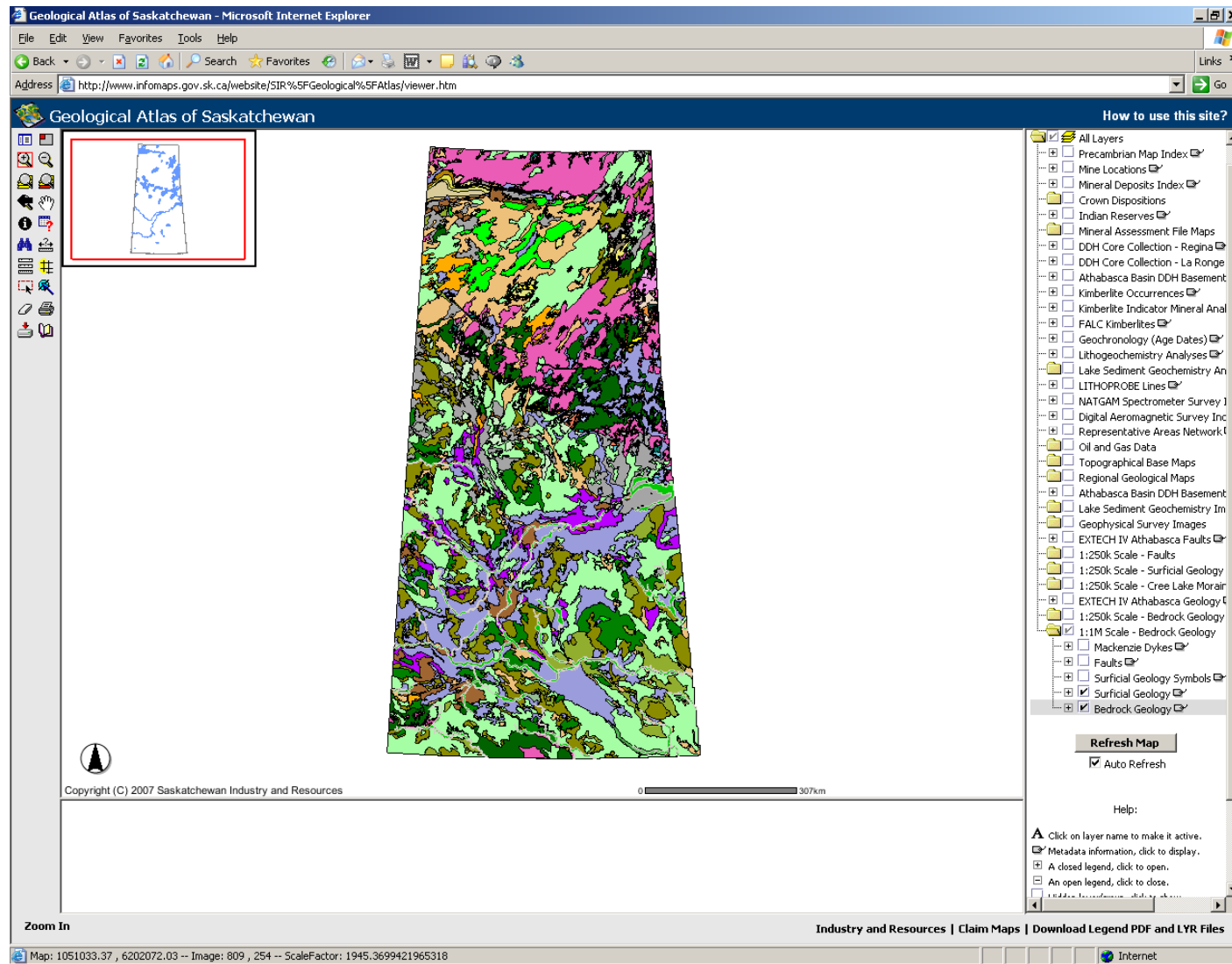
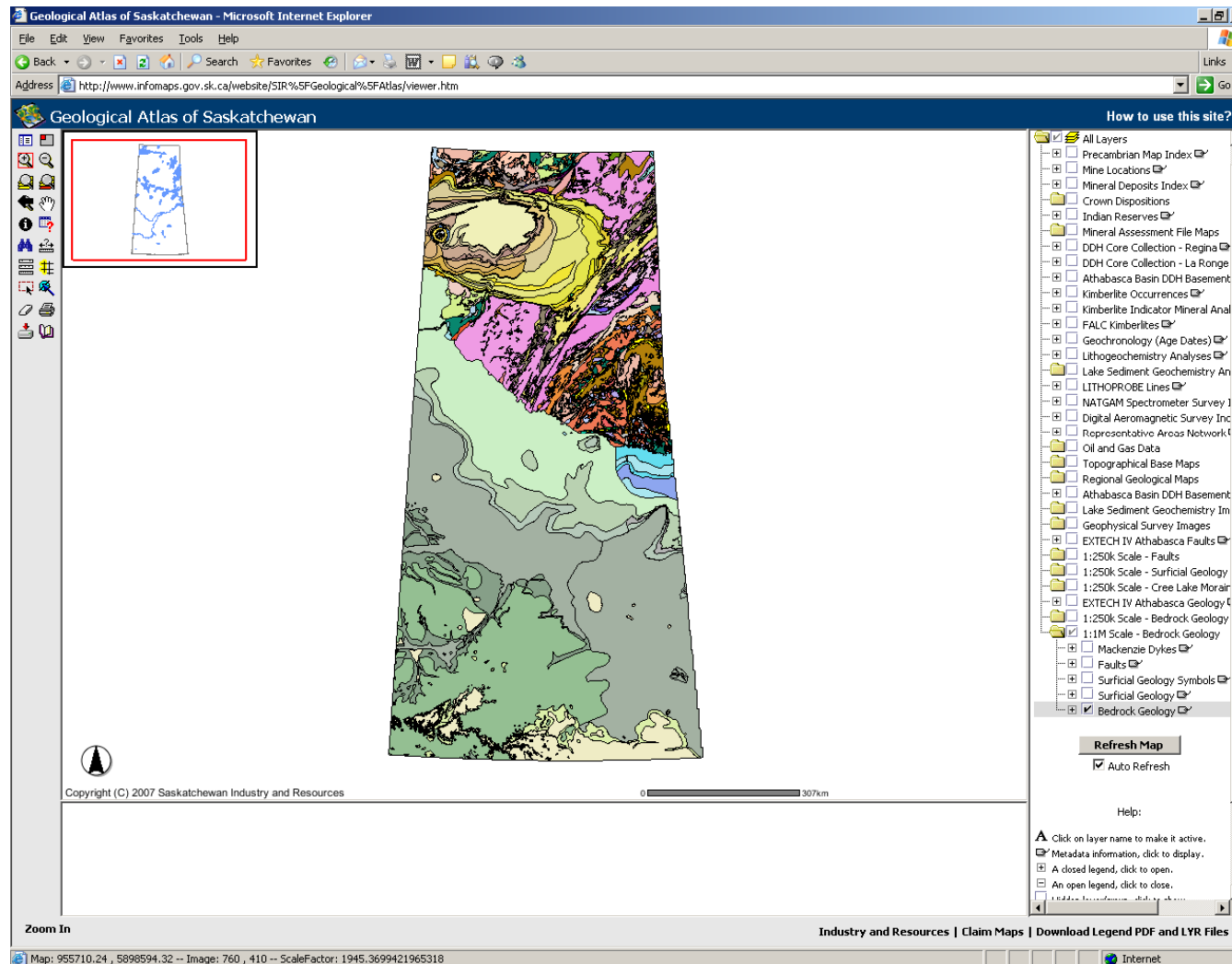


Figure 4: Online Interactive Geological Atlas of Saskatchewan – Bedrock Geology





## **4.0 Manitoba Aggregate Resources**

### **4.1 Aggregate Ownership**

#### **Private Land**

Aggregates are privately owned except where the subsurface is owned by the Crown. The legislation's broad definition under the Mines and Minerals Act of aggregate as:

“a quarry mineral that is used solely for construction purposes or as a constituent of concrete other than in the manufacture of cement and includes sand, gravel, clay, crushed stone and crushed rock”

is significant because the Act requires “private aggregate quarries” to be registered. See Legislation below.

#### **Crown Land**

Private companies may produce aggregates from crown land under the authority of a quarry permit or quarry lease granted under the Mines and Minerals Act, however the Crown reserves the right to withdraw these leasing rights if they deem it necessary.

### **4.2 Legislation**

Aggregate production in Manitoba falls under the Mines and Minerals Act, which can be found at the following weblink address:

<http://web2.gov.mb.ca/laws/statutes/ccsm/m162e.php>

Registration of private aggregate quarries is required under Section 196 (1) of this act, although the Minister may exempt an aggregate quarry that was in operation prior to 1991 when the Act came into force.

Access to Crown land for aggregate production is permitted under the authority of a quarry permit or a quarry lease granted under this Act or where a permit is issued by the Director of Mines.

The Mines Branch is responsible for ensuring the rehabilitation of pits and quarries in Manitoba (Figure 1). Landowners who have a pit or quarry on their property can apply to have their pit or quarry rehabilitated through Manitoba's Pit & Quarry Rehabilitation Program. This program is funded through levies applied to aggregate producers in Manitoba.

The “Quarry mineral rehabilitation levy” is based upon the amount of aggregate quarry minerals produced (whether on private or Crown owned lands) and is deposited into the "Quarry Rehabilitation Reserve Account". Expenditures from this fund are used to

rehabilitate quarried lands or to cover the government costs in administering the quarry rehabilitation program.

Details on the rehabilitation program can be located at weblink:

<http://www.gov.mb.ca/iedm/mrd/mines/sustain/quarry.html>

Since 1992, the Pit & Quarry Rehabilitation Program over \$14 million has been collected and expenditures on rehabilitation over that same period have exceeded \$10 million. This work is overseen by the Mines Branch of the Mineral Resources Division. The necessary heavy equipment are hired under contract. Over 1100 separate rehabilitation projects have been undertaken and over 4800 hectares (12,000 acres) of depleted surface-mined lands have been rehabilitated to a safe and environmentally productive condition. Many of these areas have been restored to agricultural use. Projects also include reclamation of degraded areas within Wildlife Management Areas, Provincial Forests, and Provincial Parks.

#### **4.3 Resource Management (Land Use Planning)**

One of the major dilemmas of the aggregate industry arises from the economic pressure to mine mineral sources as close to the market/population centres as possible. This often puts mining of aggregate, a heavy industrial activity, in direct competition with other land uses, in the 'public eye', and often in conflict with neighboring residential properties. Environmental standards governing the operation of pits and quarries are set out by regulation under *The Mines & Minerals Act*. In addition, the Mineral Resources Division has an ongoing program to identify high-potential mineral sources and to prevent their sterilization by other incompatible land use developments such as housing. Such conservation of known, high-quality sources of aggregate is established as a Provincial Land Use Policy under *The Planning Act*.

See Weblink: <http://www.gov.mb.ca/iedm/mrd/mtf/mintaskforce-a.html> (Figure 2)

#### **4.4 Granular Resource Inventories**

Departmental Responsibility for Aggregate / Granular Resource Inventories are being carried out by the Manitoba Geological Survey, Manitoba Science, Technology Branch in the Energy and Mines Department.

In general, an inventory area is based on a rural municipality boundary rather than a map sheet, as a lot of the work is prepared in support of municipal plan development. Mapping is usually at 1:50 000 but can vary, e.g. the recent mapping of the Regional Municipality of Grahamdale is at 1:100 000.

## **Methodology**

The aggregate inventory was carried out in two stages: office compilation followed by field work. Previously mapped deposits were transferred onto 1:20 000 township photomosaics (1997 orthophotos). The township mosaics are used as a base on which to compile aggregate information from several sources:

- 1) Active pit and quarry locations – Mines Branch quarry database
- 2) Quarry lease and withdrawn locations – Mines Branch plat books
- 3) Crown vs. private ownership – Manitoba Crown Lands Branch database
- 4) Pit and sample locations - Geological Survey Pleistocene database
- 5) Pit and sample locations - Department of Highways block files.
- 6) Mineral inventory cards – Geological Survey

Quarries, gravel pits, road cuts and natural exposures are examined during the first part of the field examination for types of material, degree of depletion and status (active/inactive/depleted). Unopened portions of deposits are inspected and land uses that would limit aggregate extraction noted. Site locations are recorded by GPS using UTM co-ordinates, as well as section-township-range notation.

Representative samples from sand and gravel deposits are taken for processing by the Material and Research Branch of the Department of Transportation and Government Services (Highways) under the co-operative agreement initiated in 1998. Bedrock quarries are not sampled, however, the GPS co-ordinates of bedrock outcrops are recorded.

## **4.5 Public Access and Availability to Data**

### **Reports/Publications**

There are a series of Aggregate Reports that have been published and are available to purchase from the Manitoba Government (Figure 3).

Aggregate Reports can be found and purchased through online ordering by going through the Manitoba Science, Technology, Energy and Mines Department, Mineral Resources Division Website's Publication Sales page, found here (Figure 4):

<http://www2.gov.mb.ca/itm-cat/pubsalesall.htm>

Selecting "Aggregate Reports" provides a listing of 70 aggregate reports that can be ordered on-line at a cost of \$5.00 and \$10.00 each.

Surficial Geology Maps and Bedrock Geology maps compiled by the Geological Survey of Canada and the Manitoba Geological Survey at a scale of 1:250,000 or 1:500,000 can be viewed online through an interactive mapping program at weblink (Figure 5):

<http://www.gov.mb.ca/iedm/mrd/geo/gis/geoscimaps.html>

Figure 6 shows a sample of the Interactive Surficial Geology map.

These maps are available to purchase in hard copy or can be downloaded in pdf format or as zipped ESRI shapefile (GIS) files.

## **4.6 References**

### **Aggregate Resource and Surficial Geology Maps and Reports**

1. Title: Aggregate resources in the Rural Municipality of Cameron

Author: Groom. H.D.

Product No.:

Ministry Reference:

Category: Miscellaneous/

Additional Information: in Report of Activities 2000, Manitoba Industry, Trade and Mines, Manitoba Geological Survey, p. 217-219.

2. Title: Aggregate resources in the rural municipalities of Ste. Anne and Turtle Mountain and in the Buffalo Point area

Author Groom, H.D.

Additional Information: *in* Report of Activities 2002, Manitoba Industry, Trade and Mines, Manitoba Geological Survey, p. 295-302.

3. Title: Aggregate resources in the Rural Municipality of Wallace

Author: Berk, P.R.

Product No.:

Ministry Reference: Manitoba Energy and Mines; Mineral Resources Division

Category: Miscellaneous

Format: Aggregate Report 85-1, 17 p. + 1 map @ 1:50\_000

Additional Information:

4. Title: Surficial geology of Nejanilini Lake, Manitoba

Author: G.L.D. Matile (2005)

Product No.: Preliminary Map PMAP2005-4

Ministry Reference: Miscellaneous/Manitoba Geological Survey

Format: Digital (parts of NTS 64P5, 12 and 13)

Additional Information:

5. Title: Surficial geology of southern Manitoba (south of 53°)

Author: G.L.D. Matile and G.R. Keller

Product No.:

Ministry Reference: Miscellaneous/Manitoba Geological Survey

Format: Digital

Additional Information: [www.gov.mb.ca/itm/mrd](http://www.gov.mb.ca/itm/mrd)

6. Title: Aggregate resources in the Rural Municipality of Grahamdale, Manitoba  
Geoscientific Map

Author: H.D. Groom. Manitoba Geological Survey

Product No.: MAP 2006-1

7. Title: Surficial geological investigations in the Kasmere–Putahow lakes area,  
northwestern Manitoba (parts of NTS 64N10, 11, 14 and 15)

Author: G.L.D. Matile

Product No.:

Ministry Reference:

Category: Miscellaneous/Manitoba Geological Survey

Format: Digital

Additional Information: Report of Activities 2006, Manitoba Science, Technology,  
Energy and Mines

8. Title/ Source: <http://www2.gov.mb.ca/itm-cat/pubsalesall.htm> - Main site for ordering  
reports and maps for aggregate resources in Manitoba

### **Aggregate Policy and Legislation**

9. Title: Summary of Provincial/Federal Natural Resource Planning Activities, East Side  
of Lake Winnipeg Planning Area, East Side Planning Initiative, 2004

Author: Brian Wilkes and Associates Ltd.


Ministry Reference: Appendix 8.15, Summary of Departmental Planning Activities

Additional Information: Summary of Provincial/Federal Natural Resource Planning  
Activities, East Side of Lake Winnipeg Planning Area

10. Title: Quarry Minerals Regulation, 1992, Mines and Minerals Act (C.C.S.M. c.  
M162)

# Figure 1: Manitoba - Pit & Quarry Rehabilitation Program

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- [Who May Apply?](#)
- [How Do I Apply?](#)
- [What Is The Procedure After Applying?](#)
- [What Does It Cost The Land Owner?](#)
- [What Constitutes "Rehabilitation"?](#)

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#### Implementing Sustainable Development

The Manitoba Round Table on Sustainable Development identified site rehabilitation and remediation as one of the founding principles for building a better environment. This new program was developed as an aggregate industry initiative to implement sustainable development in relation to pits and quarries within the province. It provides an equitable and efficient means of funding rehabilitation work. At the same time, the contracting of the rehabilitation work back to private industry creates employment opportunities and spreads economic activity back into the local community.

Did you know that depleted pits and quarries can be rehabilitated at no cost to the land owner?

Building upon the initiative launched by the Manitoba Round Table on Sustainable Development, a new program was introduced in 1992 under the Mines and Minerals Act to rehabilitate depleted pits and quarries throughout the province.

A dedicated fund for this purpose has been established, based on a \$0.10 per tonne environmental levy now collected on all current and future aggregate production. Since this program was introduced, hundreds of projects have been undertaken, rehabilitating thousands of acres of depleted pits and quarries across Manitoba.




#### Who May Apply To Have Rehabilitation Work Done?

Any land owner who has a depleted pit or quarry on their property may apply to have it rehabilitated.

## Figure 2: Manitoba - Aggregate Industry Overview

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**Mining Task Force**

**The Aggregate Industry in Manitoba**

**What is Aggregate?**

Each year millions of tonnes of aggregate are mined from literally hundreds of pit and quarry locations across Manitoba. Table 1 presents aggregate production in Manitoba from 1993 to 2000. Virtually everything we build requires aggregate materials, either as an engineered soil base for stability or in the form of concrete or asphalt products. Aggregate is used both in and under our roads, highways, streets, sidewalks, airports, railways, parking lots, sewers, foundations and in the buildings themselves. Other specialty uses include pre-cast concrete products, filtration in septic fields, backfill in underground mines, winter road sanding and armoring 'rip-rap', which prevents erosion on shorelines and water courses. In spite of the enormous technological strides over the last century, there are still no economically viable substitutes for aggregate in the construction industry. Aggregate is a critical resource for the province, as important as water and electricity.

**Content Links:**

- [What is Aggregate](#)
- [Aggregate Production in Manitoba 1993-2000](#)
- [Where is Aggregate Mined?](#)
- [Industry Value](#)
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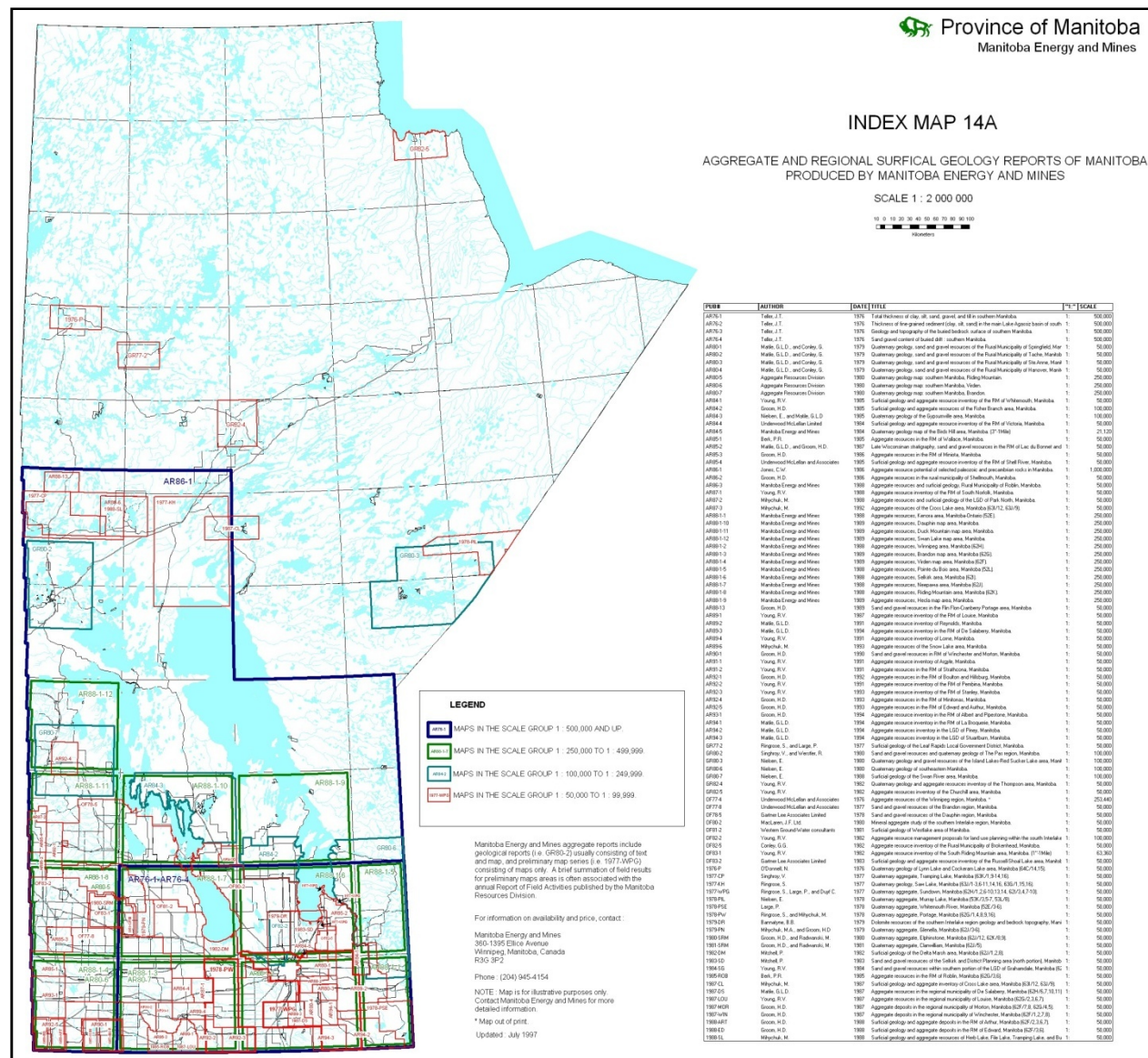
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**Table 1: Aggregate Production in Manitoba 1993 - 2000 (tonnes)**

	Private	Crown (Lease & Permit)	Total
1993	9 813 880	3 102 850	12 916 730
1994	10 118 340	3 849 980	13 968 330
1995	10 592 830	3 563 570	14 156 410
1996	11 498 940	3 271 960	14 770 910
1997	13 034 250	3 405 260	16 439 510
1998	14 127 162	2 506 778	16 633 940
1999	13 092 844	3 272 146	16 364 990
2000	10 858 063	2 998 233	13 856 296




### Figure 3: Manitoba - Index of Aggregate and Surficial Geology Reports



## Figure 4: Manitoba - Online Publication Sales

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**Figure 5: Manitoba Geological Survey GIS Map Gallery**

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Mineral Resources Division



# Geological Survey


## GIS Map Gallery

Geographic Information System


### Geoscientific Maps

All maps in the Map Gallery are in Universal Transverse Mercator projection, zone 14, North American Datum 1983.


If you encounter any problems, please contact Kevin Liu, the [GIS Administrator](#).




**Geological Map of Manitoba:** Geology, geophysics, geochronology & mineral occurrences maps for Manitoba. Scale= 1:1 000 000  
[Downloadable Geophysics](#)



**NATMAP Shield Margin Project:** Results of the Federal/Provincial 1:100 000 geological compilation program in the Flin Flon greenstone belt of Manitoba & Saskatchewan.




**Manitoba's Integrated Anomaly Map:** Compilation of structural, topographic, potential field and geologic data focussed toward identifying deep crustal structures and occurrences of kimberlite.  
[More details on Manitoba's Integrated Anomaly Map](#)



**Bedrock Geology Compilation Map Series (BGCMS):** Derived from the Manitoba Geological Survey BGCMS program. Scale= 1:250 000

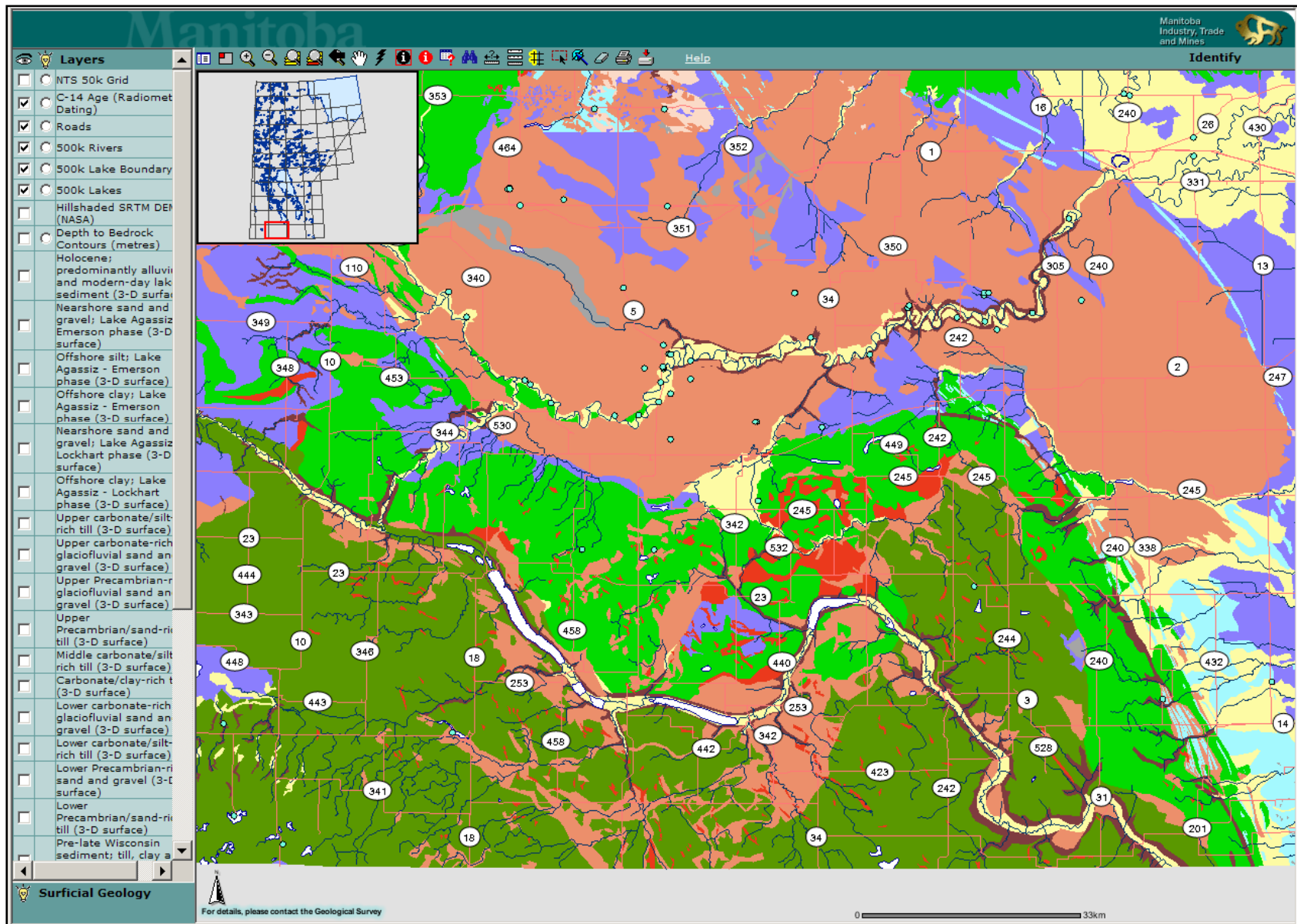


**Geological Compilation of Southeast Manitoba:** Results of the Federal/Provincial 1:250 000 scale geological compilation program in southeastern Manitoba.



**Surficial Geology Compilation Map Series:** Edge-matched compilation of surficial geology maps published by the GSC and MGS on a topographic base. Includes georeferenced images of phase 1 of the southern Manitoba 3-D model.  
[More details on the Surficial Geology Compilation Map Series](#)

**Figure 6: Manitoba - Online Interactive Surficial Geology Map**





## 5.0 Ontario Aggregate Resources

### 5.1 Aggregates Ownership

**Private Land** – the aggregates are privately owned except where the sub-surface rights are reserved to the Crown. In parts of Ontario designated under the Aggregate Resources Act, pit and quarry operations on private land are subject to the Act and an operating licence or a wayside permit (short term permit for public authority projects) is required.

**Crown Land** – minerals on Crown Lands, including the aggregates, are reserved to (owned by) the Crown and Administered by the Ministry of Natural Resources (MNR) under the Aggregate Resources Act. Aggregate Permits are required for extraction of aggregates on Crown Lands.

**Jointly:** Private Land (Surface Rights only) or on Leases of Crown Land, the sub-surface mineral rights including aggregates are reserved to the Crown and aggregate extraction is subject to the Aggregate Resources Act. An Aggregate Permit is required for any extraction activity.

### 5.2 Legislation

#### *Aggregate Resources Act*

The Ministry of Natural Resources has primary responsibility for management of aggregate resources in Ontario. Aggregates are any combination of sand, gravel, or crushed stone, and are essential for construction and such manufactured products as glass and paint.

The Aggregate Resources Act can be viewed at weblink:

[http://www.e-laws.gov.on.ca/html/statutes/english/elaws\\_statutes\\_90a08\\_e.htm](http://www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_90a08_e.htm)

The former Pits and Quarries Control Act, 1971, was replaced by the Aggregate Resources Act in 1990. The Aggregate Resources Act:

- Provides for the management of aggregate resources of Ontario
- Controls and regulates aggregate operations on Crown lands and private lands
- Requires the rehabilitation of land from which aggregate has been excavated, and
- Minimizes the adverse impact of aggregate operations on the environment.

The Act requires a complete public and agency review of any potential environmental impacts resulting from any new aggregate operations on private land and provides a system of monitoring, inspection and enforcement of regulatory requirements over the life of an operation.

Aggregate operations on Crown land are subject to requirements under the Aggregate Resources Act. Most private land in southern Ontario, including the Greater Golden Horseshoe Greenbelt, is designated, as are the Sudbury, Wawa and Sault Ste. Marie areas of northern Ontario.

Effective January 1, 2007, the Act was extended to all private land in southern Ontario and parts of central and northern Ontario not previously covered – including:

- all of Muskoka and Parry Sound districts and Haliburton County; and
- parts of Algoma, Nipissing, Sudbury, Manitoulin and Thunder Bay districts as well as parts of Renfrew, Peterborough, Hastings, Frontenac, and Lennox and Addington counties.

With these new designations in effect, most significant aggregate resource production areas in Ontario fall under the act.

Regulations governing aggregate extraction, including the designation of areas under the Act, can be viewed at Weblink:

<http://www.mnr.gov.on.ca/MNR/aggregates/rules.html> .

The Aggregate Resources Act includes a series of Standards (Figure 1) that govern the application format and development of extraction operations in Ontario

<http://www.mnr.gov.on.ca/MNR/aggregates/standards.html>

Other Legislation has a significant effect on development of aggregates in Ontario (Table 1).

This legislation can be viewed at Weblink:

(<http://www.mnr.gov.on.ca/MNR/aggregates/legislation.html>)

### **5.3 Resource Management (Land Use Planning)**

Departments/Branches/Agencies with responsibility for Aggregate Resources include:

1. Ministry of Natural Resources (MNR) – Aggregate Resources Act and Mineral Aggregate Resources Policy Statement
2. Ministry of Transportation (MTO) – Aggregate Resource Permits for aggregate extraction on Crown Land in areas not designated under the Aggregate Resources Act.
3. The Ontario Aggregate Resources Corporation (TOARC) - a Non-Government agency responsible for the collection and disbursement of licence fees from pit and quarry operations in designated areas under the Aggregate Resources Act, in association with MNR.

### **Licensing and Permitting**

MNR's Natural Resource Management Division's role provides for:

- The development, implementation and review of policies, procedures and legislation governing the management of aggregate resources within the province of Ontario;
- Direction and interpretation to field staff, industry, municipalities, government agencies, consultants, the public and senior management within MNR;

## Canadian Granular Inventory Programs – Ontario Aggregate Resources Inventory Program

- Education and training to MNR staff, industry, stakeholders and other ministries, boards and agencies; and
- Liaise with other provincial and federal jurisdictions with respect to aggregate resource management.

MNR's Field Services Division (District Offices) employs Aggregate Inspectors whose responsibilities include:

- The processing of applications for the approval for licences, permits, licence transfer, site plan amendments and related documents;
- Conduct pit and quarry inspections and audits of aggregate operations to ensure that licensees and permittees are in compliance with the Aggregate Resources Act, the site plans, and that progressive rehabilitation is being carried out;
- Enforcement of offences under the Aggregate Resources Act by the issuance of suspension notices, rehabilitation orders and/or revocations of permits and licences;
- Participate in hearings related to aggregate licence applications under the Aggregate Resources Act before the Ontario Municipal Board for private land or before the Mining and Lands Commissioner for Crown land permit application; and
- Administer other aspects of the aggregate program (e.g. including complaint resolution, education and training and participation in municipal land-use planning).

Conservation Officers whose responsibilities include:

- Investigation and prosecution of offences under the Act, in conjunction with the Aggregate Inspectors

Natural Resource Planners, Biologists, Ecologists, Foresters whose duties include:

- Participation in the municipal planning process through the Ministry of Municipal Affairs and Housing to ensure that aggregate resources are protected and made available;
- Review of applications and amendments with respect to the protection of natural heritage features, to ensure that adverse impacts of aggregate operations on the environment are minimized."

MNR has delegated to the Ministry of Transportation (MTO) the authority under the Aggregate Resources Act for the issuance and management of wayside permits and aggregate permits, where the aggregate is required for provincial road projects. MTO's role related to these permits include:

- Processing applications for permits, site plan amendments, etc. and issue related documents;
- Conducting inspections and audits of aggregate operations to ensure that they are in compliance with the Act, the site plans, conditions of the permit, and that rehabilitation is being carried out; and
- Enforcement of offences under the Aggregate Resources Act (e.g., suspension notices and rehabilitation orders).

## Land Use Planning

Mineral Aggregate Resources Policy (MARPS) was the first Provincial Policy Statement in Ontario issued under the Planning Act in 1986. It has undergone various changes since that time and has been joined by policy statements on other natural resources (e.g. petroleum, hazard lands, archaeology, wetlands, ecology etc.). Municipal planning must be in accordance with the provincial policy statements and balance to the extent possible any conflicts between the policy statements. The Ontario Municipal Board (OMB) is the adjudicator where conflicts arise between proposed development and protection of natural resources.

## **5.4 Granular Resource Inventories**

Systematic granular resource evaluations conducted by the Ontario Geological Survey were first implemented in the 1970's. The results have been published in a series of "Aggregate Resource Inventory Papers (ARIP)" (Figure 2) commencing in 1979 with published reports providing coverage for most of southern Ontario (see Figure 3). The Ontario Geological Survey is under the umbrella of the Ministry of Northern Development and Mines (MNDM).

The inventory work program includes:

**1. Office Component:** Interpretation of aerial photography and surficial geology specific to Aggregates to identify and determine the surface expression and topology of potential aggregate deposits. Review bedrock mapping to identify potential bedrock formations suitable for construction uses.

**2. Field Work:** includes Surficial Mapping (Ground Truthing) and Aggregate Programs with an emphasis on mapping and testing of aggregate deposits including collection and classification of samples of sand, gravel and bedrock potentially suitable for use in construction.

Sampling Methods include: sampling of existing pit or quarry faces and hand dug or excavated test pits. Collection of sand & gravels samples recovered from boreholes or bedrock from diamond drill holes. Field data is supplemented with information from Well Water Records and other test pit or borehole data where this is available.

The level of confidence in the sampling and information is indicated in the text of the reports.

**3. Laboratory (Analytical) Programs** may include some or all of the following analyses:

- a) Grain Sizes using the Metric (Wentworth) or Standard (Engineering) screen sizes
- b) Petrographic Analysis (Rock Quality of Aggregates and identification of potentially deleterious mineralogies)
- c) Alkali Reactivity Testing (concrete mortar bar testing to identify potential long-term reactions between the cement paste and reactive minerals such as amorphous silicates).

Deposits with potential for further extractive development or those where existing data are scarce, are studied in greater detail. Representative sections in these deposits are evaluated by



taking 11 to 45 kg samples from existing pit faces or from test pits. The samples are tested for grain size distribution, and in some cases the Los Angeles abrasion and impact test, absorption, magnesium sulphate soundness test and detailed petrographic analyses are carried out. These analyses were often performed in the laboratories of the Ontario Ministry of Transportation.

### **5.5 Public Access and Availability to Data**

Aggregate Resource information (e.g. Aggregate Resource Inventory Papers (ARIPs), Aggregate Resource Inventory Maps (ARIMs) and Open File Reports (OFRs) can be ordered by phone from Publication and Sales at the MNDM (Figure 4). The ARIPs and OFRs are available only in hard copy. The ARIMs are available in digital GIS format and are supplied on DVD.

#### **Internet Availability/Website**

Indexes listing ARIPs/ARIMs (per Figure 3) and Open File Reports are posted on the MNDM weblink (4) at:

<http://www.mndm.gov.on.ca/mndm/mines/>

and are available for order by phoning the MNDM Publication Sales Office.

#### **Navigating the Website**

The MNDM website is a little difficult to navigate until finding the Mines and Minerals Division Page. Once there, the site can be navigated fairly easily, to locate available publications and digital data at weblink:

<http://www.geologyontario.mndm.gov.on.ca/>

This page (Figure 5) takes on the form of a search engine. Under “Publication Title” select “contains word” and type in “aggregates”. To narrow down the search type in a range of years if known, under “Publication Year”. Other parameters, if known can also be entered to narrow down the search.

Legislation governing aggregate extraction and Land Use Policies protecting aggregates and other natural features are administered by the Ministry of Natural Resources.

General Aggregate Resources information is easily accessed on the MNR weblink (Figure 6) at:

<http://www.mnr.gov.on.ca/MNR/aggregates/>

The Aggregate Resources Act and other related legislation that affects aggregate extraction ( Table 1 and Appendix 1) is located at weblink:

[http://www.e-laws.gov.on.ca/DBLaws/Statutes/English/90a08\\_e.htm](http://www.e-laws.gov.on.ca/DBLaws/Statutes/English/90a08_e.htm) ).

The Ontario Aggregate Resources Corporation (TOARC) collects statistical information on aggregate production and rehabilitation. Information on the Aggregate industry is released in an annual report on aggregate production, rehabilitation and reclamation of and abandoned pits and quarries can be obtained from the TOARC (Figure 7) weblink at:

<http://www.toarc.com/>

## **5.6 Reports/Publications**

Aggregate Resource Inventory Papers cover most of southern Ontario as shown on the attached Index Map (Figure 2) issued by the Ontario Geological Survey (MNDM). The ARIP's contain information on material type, thickness, area, volume, surficial drainage, overburden type and thickness. The ARIP's include reports that describe the make up of the resources and their potential uses (e.g. Concrete, hot mix, etc.). These aggregate resource reports are accompanied by a series of maps in hard copy.

MNDM also makes the digital data from these maps available in GIS format in files referred as Aggregate Resource Inventory Maps (ARIMs).

Open File Reports (OFRs), which can be purchased in hard copy format from MNDM, are similar to ARIPs, but are not as complete or finalized. The purpose is to release the data as soon as practical to assist municipal planning or provincial construction projects.

Table 1 - Other Legislation Affecting Aggregate Extraction

Source: <http://www.mnr.gov.on.ca/MNR/aggregates/legislation.html>

Legislation	Jurisdiction	Purpose	Effect on Aggregate Extraction Activities
<a href="#">Conservation Authorities Act</a>	Provincial	To establish a program to conserve, restore, develop and manage watersheds	<ul style="list-style-type: none"> <li>Restricts alterations to rivers, streams, and creeks through the Lakes and Rivers Improvement Act, administered by the Conservation Authority</li> </ul>
<a href="#">Endangered Species Act</a>	Provincial	Provide for the conservation, protection, restoration and propagation of species of fauna and flora that are threatened with extinction	<ul style="list-style-type: none"> <li>Forty-two species are listed in regulation under the Act. The species and habitat are protected from wilful harm or destruction.</li> <li>Some examples are (e.g. Loggerhead Shrike, Blue Racer Snake, Bald Eagle, Prickly Pear Cactus, American Ginseng)</li> </ul>
<a href="#">Environmental Assessment Act</a>	Provincial	To provide for the protection, conservation and wise management of Ontario 's environment	<ul style="list-style-type: none"> <li>Crown aggregate dispositions are reviewed subject to MNR's Class EA for Resource Stewardship and Facility Development Projects</li> <li>Proposals for aggregate extraction on private land must be designated by regulation</li> </ul>
<a href="#">Environmental Bill of Rights</a>	Provincial	To protect and restore the natural environment and to protect people's right to a healthy environment	<ul style="list-style-type: none"> <li>Requires posting of licensed aggregate extraction proposals and decisions on Ontario Environmental Bill of Rights Registry for at least 30 days</li> </ul>
<a href="#">Environmental Protection Act</a>	Provincial	To provide for the protection and conservation of the natural environment	<ul style="list-style-type: none"> <li>Dust emissions must meet the standards as set out in Regulations</li> <li>Noise is considered a contaminant and should meet the requirements under the Municipal Noise Control By-law</li> <li>Regulates crushers, asphalt plants, concrete-batching plants, screeners, drilling and blasting etc</li> </ul>
Fisheries Act	Federal	The proper management and control of the fisheries, the conservation	<ul style="list-style-type: none"> <li>Where fish habitat is identified, requires review by Department of Fisheries and Oceans or</li> </ul>

Canadian Granular Inventory Programs – Ontario Aggregate Resources Inventory Program

		and protection of fish and the protection of fish habitat, and the prevention of pollution	Conservation Authority.
<a href="#">Greenbelt Act</a>	Provincial	To protect environmentally sensitive and agricultural land in the Golden Horseshoe	<ul style="list-style-type: none"> <li>Maximum allowable disturbed must be maintained and in the Natural Heritage System, enhanced rehabilitation is required</li> </ul>
Migratory Birds Convention Act	Federal	Protection of migratory birds and nests	<ul style="list-style-type: none"> <li>Ensures that habitat sites are not disturbed or destroyed during nesting periods (e.g. Swallows, Great Blue Herons)</li> </ul>
<a href="#">Mining Act</a>	Provincial	To encourage prospecting, staking and exploration for the development of mineral resources	<ul style="list-style-type: none"> <li>Prospectors can stake mining claims and bring the property to lease under the Mining Act</li> <li>Minerals other than aggregate, require a closure plan under the Mining Act for extraction to occur</li> </ul>
<a href="#">Niagara Escarpment Planning &amp; Development Act</a>	Provincial	Provide for the maintenance of the Niagara Escarpment as a continuous natural environment	<ul style="list-style-type: none"> <li>Strict planning approvals in place</li> <li>Also designated as a "World Biosphere Reserve" by UNESCO</li> </ul>
<a href="#">Oak Ridges Moraine Conservation Act, 2001</a>	Provincial	To protect the ecological and hydrogeological integrity of the Oak Ridges Moraine area	<ul style="list-style-type: none"> <li>Restricts development of sand and gravel operation in certain areas</li> <li>Ensures strict adherence to rehabilitation standards</li> <li>No below water extraction can take place on new sites in the Natural Linkage Area</li> </ul>
<a href="#">Occupational Health and Safety Act</a>	Provincial	Identifies the responsibilities of owners, constructors, employers and employees in all matters of health and safety	<ul style="list-style-type: none"> <li>Requires protection for inadvertent access to a pit or quarry</li> <li>Regulates the maximum vertical heights of pit &amp; quarry faces</li> <li>Regulates the storage of explosives and magazines containers</li> <li>Provides for worker safety around equipment</li> </ul>
<a href="#">Ontario Water</a>	Provincial	To provide for the protection of water	<ul style="list-style-type: none"> <li>Aggregate operations require permits to take water and</li> </ul>

Canadian Granular Inventory Programs – Ontario Aggregate Resources Inventory Program

<a href="#">Resources Act</a>		supplies	discharge water off site
<a href="#">Planning Act</a>	Provincial	Provides for land use planning	<ul style="list-style-type: none"> <li>• Must have regard to provincial policy statements issued under this Act</li> <li>• Licences under the Aggregate Resources Act cannot be issued unless the location of the site complies with the local zoning by-law</li> </ul>
<a href="#">Public Transportation and Highway Improvement Act</a>	Provincial	Placing structures or buildings adjacent to a Class 1 highway	<ul style="list-style-type: none"> <li>• Regulates the approval of entrances and exits to a pit or quarry site adjacent to provincial highways through a permit process</li> </ul>
Species at Risk Act	Federal	To protect and manage wildlife species at risk	<ul style="list-style-type: none"> <li>• No person can destroy and endangered and threatened species or there habitat</li> </ul>
<a href="#">Technical Standards and Safety Act, 2000</a>	Provincial	To enhance public safety by providing for efficient and flexible administration of technical standards	<ul style="list-style-type: none"> <li>• Regulates placement of fuel storage tanks and fuel handling in aggregate sites</li> </ul>

Source: <http://www.mnr.gov.on.ca/MNR/aggregates/legislation.html>

## **5.7 References**

1. Title: Red Lake Regional Resident Geologist Report: Red Lake and Kenora Districts

Open File #6200

Author: A.F. Lichtblau, C. Ravnaas, C.C. Storey, A. Raoul, D. Saunders and J.McDonald

Product No.:

Ministry Reference:

Category: Miscellaneous/Ontario Geological Survey

Format: Digital - 92p., 9.8 MB

Additional Information:

<http://www.mndm.gov.on.ca/mndm/mines/ims/pub/roa/roapdfs/ofr6200.pdf>

2. Title: Thunder Bay North Regional Resident Geologist Report: Thunder Bay North District

Open File #6201

Author: M.C. Smyk, G.D. White, M.A. Puumala, M.A. Magee and C.L. Komar

Product No.:

Ministry Reference:

Category: Miscellaneous/Ontario Geological Survey

Format: Digital - 39p., 8.05 MB

Additional Information:

<http://www.mndm.gov.on.ca/mndm/mines/ims/pub/roa/roapdfs/ofr6200.pdf>

3. Title: Thunder Bay South Regional Resident Geologist Report: Thunder Bay South District

Open File #6202

Author: J.F. Scott, D.A. Campbell and C.L. Komar

Product No.:

Ministry Reference:

Category: Miscellaneous/Ontario Geological Survey

Format: Digital - 34p., 15.7 MB

Additional Information:

<http://www.mndm.gov.on.ca/mndm/mines/ims/pub/roa/roapdfs/ofr6200.pdf>

4. Title: Timmins Regional Resident Geologist Report: Timmins and Sault Ste. Marie Districts

Open File #6203

Author: B.T. Atkinson, M. Hailstone, A.C. Wilson, D.M. Draper, A. Pace and H. Woo

Product No.:

Ministry Reference:

Category: Miscellaneous/Ontario Geological Survey

Format: Digital - 97p., 12.7 MB

Additional Information:

<http://www.mndm.gov.on.ca/mndm/mines/ims/pub/roa/roapdfs/ofr6200.pdf>

5. Title: Kirkland Lake Regional Resident Geologist Report: Kirkland Lake District

Open File #6204

Author: D.L. Guindon, G.P.B. Grabowski, G. Meyer and M.C.M. Picotte

Product No.:

Ministry Reference:

Category: Miscellaneous/Ontario Geological Survey

Format: Digital - 41p., 1.10MB

Additional Information:

<http://www.mndm.gov.on.ca/mndm/mines/ims/pub/roa/roapdfs/ofr6200.pdf>

6. Title: Kirkland Lake Regional Resident Geologist Report Sudbury District

Open File #6205

Author: D. Farrow and J.M. Gaudreau

Product No.:

Ministry Reference:

Category: Miscellaneous/Ontario Geological Survey

Format: Digital - 33p., 2.84 MB

Additional Information:

<http://www.mndm.gov.on.ca/mndm/mines/ims/pub/roa/roapdfs/ofr6200.pdf>

7. Title: Southern Ontario Regional Resident Geologist Report: Southeastern and Southwestern Ontario Districts, Mines and Minerals Information Centre, and Petroleum Resources Centre

Open File #6206

Author: P.J. Sangster, K.G. Steele, P.S. LeBaron, D.A. Laidlaw, C.R. Lee, T.R. Carter and M.R. Lazorek

Product No.:

Ministry Reference:

Category: Miscellaneous/Ontario Geological Survey

Format: Digital - 68p., 1.98 MB

Additional Information:

<http://www.mndm.gov.on.ca/mndm/mines/ims/pub/roa/roapdfs/ofr6200.pdf>

8. Title: Regional Land Use Geologist Report: Northwestern, Northeastern and Southern Ontario Regions

Open File #6207

Author: R.L. Debicki, P. Hinz, G. Wm. Seim and K.G. Steele

Product No.:

Ministry Reference:

Category: Miscellaneous/Ontario Geological Survey

Format: Digital - 48p., 1.3 MB

Additional Information:

<http://www.mndm.gov.on.ca/mndm/mines/ims/pub/roa/roapdfs/ofr6200.pdf>



# Figure 1: Ontario Aggregate Resources – Provincial Standards

<http://www.mnr.gov.on.ca/MNR/aggregates/standards.html>

**Location:** MNR Home > Lands & Waters > Aggregate Resources > Rules & Regulations > Provincial Standards

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-  [Tribunals](#)

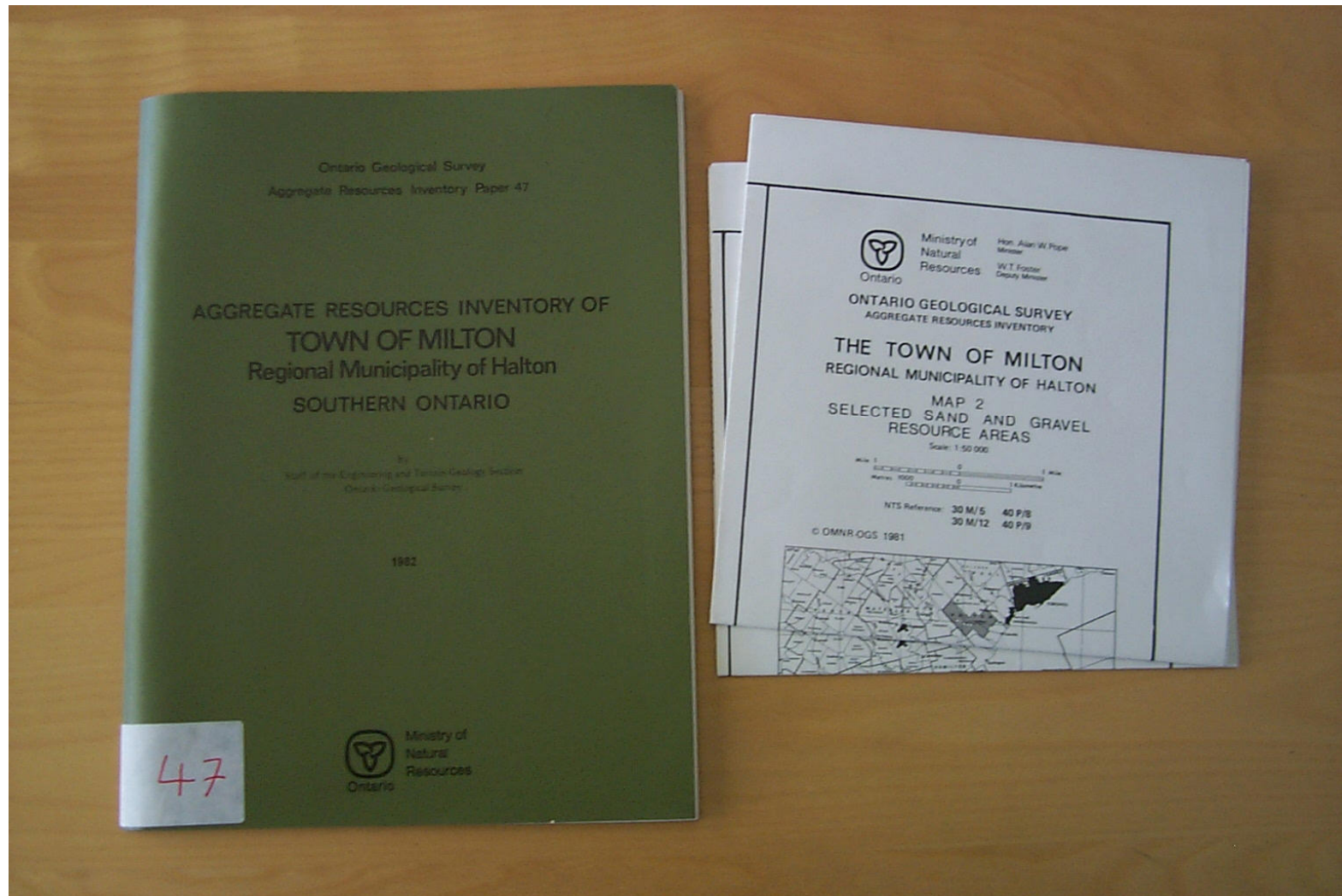
 [Rehabilitation](#)  
 [Enforcement](#)  
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## Provincial Standards

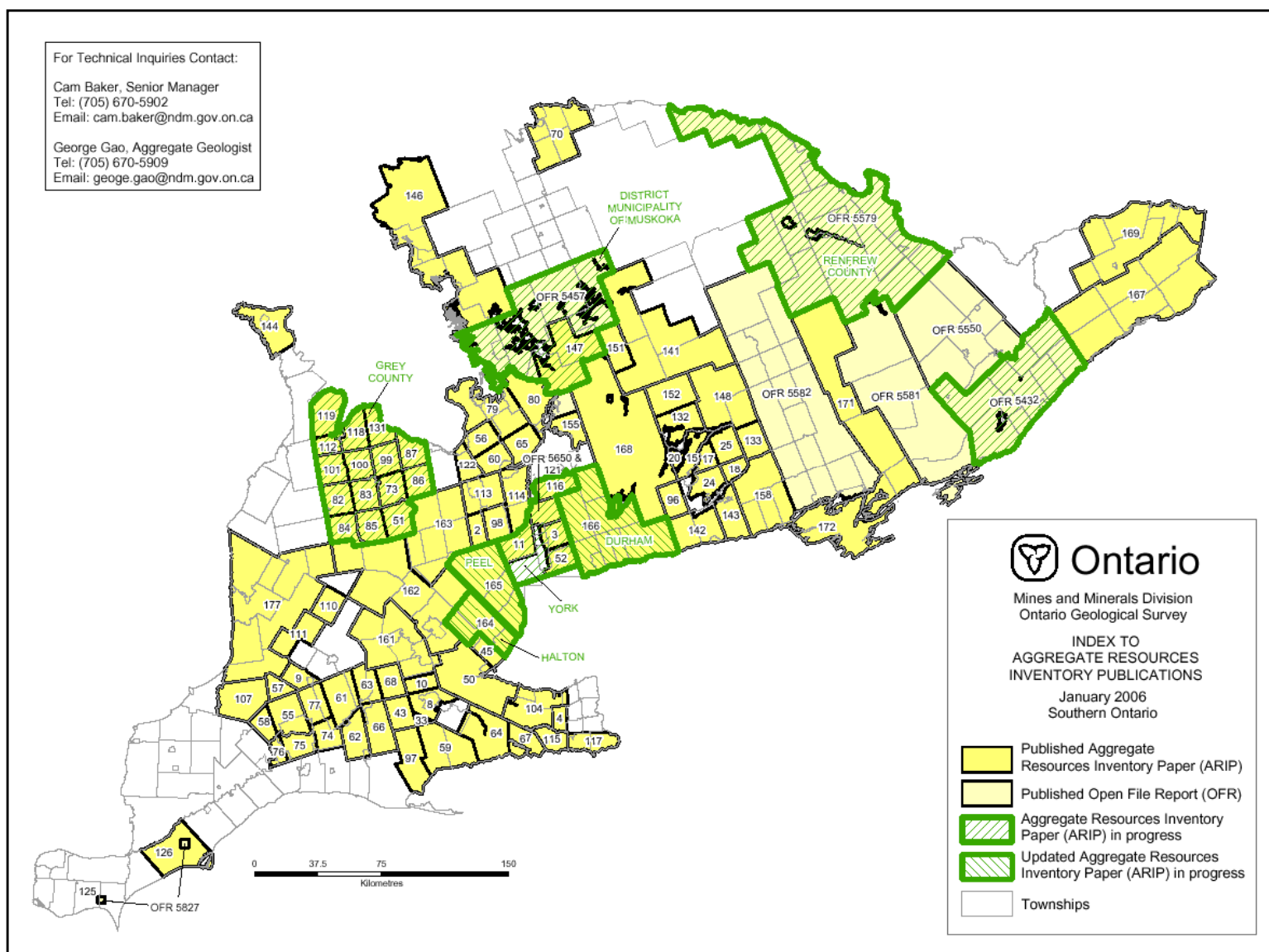
The following Aggregate Resources of Ontario Provincial Standards documents are available for download in Adobe .pdf format. You will require Adobe Acrobat Reader, which you may download at no charge from [Adobe](#) if it is not already installed on your machine.

- [Provincial Standards of Ontario – Category 1 – Class A Pit Below Water](#)
- [Provincial Standards of Ontario – Category 2 – Class A Quarry Below Water](#)
- [Provincial Standards of Ontario – Category 3 – Class A Pit Above Water](#)
- [Provincial Standards of Ontario – Category 4 – Class A Quarry Above Water](#)
- [Provincial Standards of Ontario – Category 5 – Class B Pit Below Water](#)
- [Provincial Standards of Ontario – Category 6 – Class B Quarry Below Water](#)
- [Provincial Standards of Ontario – Category 7 – Class B Pit Above Water](#)
- [Provincial Standards of Ontario – Category 8 – Class B Quarry Above Water](#)
- [Provincial Standards of Ontario – Category 9 – Pit Above Water](#)
- [Provincial Standards of Ontario – Category 10 – Pit Below Water](#)
- [Provincial Standards of Ontario – Category 11 – Quarry Above Water](#)
- [Provincial Standards of Ontario – Category 12 – Quarry Below Water](#)
- [Provincial Standards of Ontario – Category 13 – Aggregate Permit Extraction for Land Under Water](#)
- [Provincial Standards of Ontario – Category 14 – Forest Industry](#)
- [Provincial Standards of Ontario – Category 15 – Wayside Permits for Public Authority Projects](#)

**Figure 2: Aggregate Resource Inventory Paper**




# Figure 3: Ontario Aggregate Resource Inventory Map Index



[http://www.mndm.gov.on.ca/mndm/mines/ims/pub/order\\_e.asp](http://www.mndm.gov.on.ca/mndm/mines/ims/pub/order_e.asp)

## Figure 4: Ordering Publications



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**SEARCH**

Our [Search Site](#) allows you to search the MNDM Website, Ontario Government Web Sites, Telephone listings, Programs and Offices.

All Mines and Minerals and Ontario Geological Survey publications are available for **viewing** at:

- [John B. Gammon Geoscience Library](#), Willet Green Miller Centre, Sudbury
- [Mines and Minerals Information Centre](#) (MMIC) Library, Toronto
- [Regional Mines and Minerals](#) office(s) responsible for the area covered by the publication.

For information on purchasing all publications, including digital data, contact:

Publication Sales  
933 Ramsey Lake Rd., Level A3  
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Tel: (705) 670-5891 (local calls)  
Fax: (705) 670-5770  
E-mail: [pubsales.ndm@ontario.ca](mailto:pubsales.ndm@ontario.ca)

Publications, excluding digital data, may also be purchased at:

Mines and Minerals Information Centre  
Rm. M2-17, Macdonald Block  
900 Bay St.  
Toronto, Ontario M7A 1C3  
Tel: (416) 314-3800  
Fax: (416) 314-3797

**Figure 5: MNDM Data Search Page**

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- [Search Lithogeochemistry \(LGC\)](#)
- [Search Drill Hole Database \(DDH\)](#)
- [Abandoned Mines Information System \(AMIS\)](#)



**Figure 6: Ontario Ministry of Natural Resources:**

**Location:** MNR Home > Lands & Waters > Aggregate Resources

## Aggregate Resources



Photo courtesy: Nelson Aggregate Company

-  [Home](#)
-  [The Program](#)
-  [The Resources](#)
-  [Rules & Regulations](#)
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**LATEST NEWS:**

ATTENTION: Aggregate Operators within the Protected Countryside of the Greenbelt Plan Area

**Deadline for Maximum Disturbed Area Forms is September 30, 2006.**

[Find out more information..](#)

### THE RESOURCES

Aggregates are critical ingredients in a number of manufactured products like glass, coated paper, paint and pharmaceuticals. Find out more about [aggregate resources](#)...

### THE PROGRAM

The Aggregate Resources Program is delivered through MNR's Natural Resource Management and Field Services Divisions, the Ministry of Transportation (MTO) and the Aggregate Resources Trust (TOARC). Find out more about [the Program](#)...

**Figure 7: The Ontario Aggregate Resources Corporation**



**Figure 8: Ontario Aggregate Resources Act - Designated Areas**





## **6.0 Quebec Aggregate Resources**

### **6.1 Aggregates Ownership**

Broadly speaking, the province owns the mineral substances and grants mineral exploration or mining rights to applicants, who are generally companies. Landowners, except as specified below, generally do not own mineral substances.

Definitions:

Aggregates means:

- Sand
- Gravel
- Yellow soil
- Black soil
- Crushed gravel
- Moraine
- Clay
- Inert mine tailings
- Other unconsolidated deposits

Surface mineral substances (SMS):

- peat;
- sand, including silica sand;
- gravel;
- limestone;
- calcite;
- dolomite;
- common clay and argillaceous rocks used in the manufacturing of clay products;
- all types of rocks used as dimension stone, crushed stone, a source of silica, or in the manufacture of cement;
- every mineral substance that is found in its natural state as a loose deposit (excluding tilth but including inert mine tailings) when these substances are used for construction purposes, for the manufacture of construction materials or for the improvement of soils.

### **Private Land**

In certain cases, a landowner may also own certain mineral substances for domestic use such as sand, gravel, or building stone. If the land was granted or alienated by the State for purposes other than mining prior to January 1, 1966, then the landowner is the owner of these substances and can market them as they wish, as long as they comply with the environmental standards and municipal by-laws, among others.

## **Crown Land**

The Minister of Natural Resources and Wildlife (Ministère des Ressources naturelles et de la Faune - Direction des titres miniers) administers access to State owned lands and minerals under the Mining Act.

### **Jointly: Private/Crown**

Where the surface rights are held by the landowner, these rights include the sand and gravel resources if the grant was issued prior to 1966.

## **6.2 Legislation**

The Mining Act is administered by the Minister of Natural Resources and Wildlife Resources.

The *Mining Act* deals with the management of mineral resources and the granting of exploration rights for mineral substances during the exploration phase. It also deals with the granting of rights pertaining to the use of these substances during the mining phase. Finally, the act establishes the rights and obligations of the holders of mining rights to ensure maximum development of Québec's mineral resources.

The necessary information that mining stakeholders require: regarding their rights, obligations and the procedures to be followed for compliance with the legislation can be accessed under the following topic:

- Claims;
- Mining leases and concessions;
- The exploration and mining of surface mineral substances;
- Conversion, substitution and amalgamation.

To explore for aggregates or minerals on lands under the jurisdiction of the province, permission to access the land must be acquired through a claim(s). The "Claims" publication deals with the exploration and mining of surface mineral substances and provides information about the terms and conditions for granting, exercising and renewing any rights related to these activities.

The exclusive right to explore for all mineral substances, including surface mineral substances, is covered by the claim. Nevertheless, this exclusive right does not include sand, gravel and other substances that occur as natural unconsolidated deposits.

Depending on the type of substance to be extracted, a mining lease or a lease to mine surface mineral substances will be required to permit extraction. Legislation provides for two types of mining rights:

- the **non-exclusive lease**, where the substance is sand (with the exception of silica sand used for industrial purposes), gravel, inert mine tailings or any other unconsolidated deposit used for construction purposes;
- the **exclusive lease**, where these same substances are used for industrial purposes or for crushing in the context of an industrial activity, and for any other surface mineral substance that is not covered by the non exclusive lease.

In addition, the Minister of Natural Resources and Wildlife may authorize a person who does not hold a lease, to mine a fixed quantity of surface mineral substances for a limited time.

### **Mining lease**

To obtain a mining lease, the claim holder must establish the existence of indicators of the presence of a workable deposit and describe the nature, extent and probable value of that deposit. Applications should be submitted at the Office of the Registrar at one of the regional offices of the Department. The initial term of a mining lease is 20 years, and it can be renewed every 10 years while mining continues.

The holder of a mining lease is required to:

- pay an annual rent;
- submit a mine site rehabilitation plan before starting mining work;
- begin mining work during the four years following the date on which the lease is issued;
- carry out exploration or mining work each year worth at least \$35/hectare;
- remit information on mining activities.

The online publication entitled "*Mining lease and concession*":

- sets out the procedure for obtaining and renewing a mining lease;
- defines the rights and obligations of leaseholders;
- describes the various authorizations that are required before building a processing plant, and choosing storage and tailings sites;
- sets out the details regarding the requirements that comply with the site rehabilitation and restoration plan and the subdivision of the surface area.

### **Lease to Mine Surface Mineral Substances**

Legislation provides for two types of mining rights:

- the **non-exclusive lease**, where the substance is sand (with the exception of silica sand used for industrial purposes), gravel, inert mine tailings or any other unconsolidated deposit used for construction purposes;
- the **exclusive lease**, where these same substances are used for industrial purposes or for crushing in the context of an industrial activity, and for any other surface mineral substance that is not covered by the non exclusive lease.

No lease to mine surface mineral substances is issued for longer than 10 years, except for the harvesting of peat, where a 15-year lease can be issued. Leases are renewable while extraction continues.

It is not mandatory to hold a claim to extract surface mineral substances in order to determine the mineability of a deposit. However, an authorization to mine without a lease is required. The duration of the authorization will be less than one year.

Regardless of the type of lease, the holder must:

- apply for a **forest work permit** if clearing of the site is necessary;
- pay the required fees based on the quantity and nature of the substances;
- submit a report to the Department four times a year, showing the quantities extracted daily.

The online publication entitled ***The Exploration and mining of surface mineral substances*** describes the procedure for obtaining, holding and renewing rights relating to mining of surface mineral substances.

### **6.3 Granular Resource Inventories**

Since its creation in March 2006, the Bureau de l'exploration géologique du Québec (BEGQ) has been responsible for acquiring new geological knowledge throughout Québec. Its work focuses on developing Québec's mineral potential in order to encourage mineral exploration and the renewal and diversification of its mineral resources.

This work includes the evaluation of the potential for all mineral resources (metals, stone, aggregate, peat, etc.) including dimension stone and unconsolidated deposits.

Industrial minerals and stones produced in Québec in 2005 include: chrysotile asbestos, ilmenite and titanium slag, graphite, mica, rock salt and brine, clay minerals, peat, silica, as well as limestone, dolomite, and marble.

The Weblink at:

<http://www.mrnf.gouv.qc.ca/english/publications/mines/potential/2004-appendix-1.pdf>

references Appendix I of the Report on Mineral Exploration Activities in Québec 2004, that contains information on location and a summary of commodities and production tonnage of producing mines and architectural stone quarries in Québec. A map of the architectural stone quarry locations can be viewed at Weblink (Figure 1):

<http://www.mrnf.gouv.qc.ca/english/publications/mines/architectural/architectural-quarrying.pdf>

Figure III (in Appendix I of the on Mineral Exploration Activities in Québec 2004) shows the location of active quarries and mines of industrial minerals and stone, as well as producing peatlands in Québec (Figure 2). Table III in Appendix I provides a brief description of each operation.

### **6.4 Public Access and Availability to Data**

The Quebec Government, Natural Resources and Wildlife Resources website has a section dedicated to mines which includes a section on geology (Figure 3). This section of the website includes information on the mining industry and a Geological Overview (Figure 4).

Information on Exploration Rights (Figure 5) and Mining Rights (Figure 6) can be found and appropriate documentation can be downloaded from the website.

There is also a Geoscience Database (SIGEOM, Figure 7) on the website, which is a spatially referenced geo-mining information system. This system contains all the geoscience data accumulated in Québec over the last 150 years. It allows users to search for data based on specific criteria, and to obtain customized maps in the desired format. The first step is to choose a search category (Figure 8). Once this is chosen, the user can narrow down their search based on various criteria such as Geological Description, Deposit or Quarry Status among many other parameters (Figure 9).

This system can also be used to search for geological publications which can then be ordered in hard copy or downloaded in digital formats.

There no section specifically dedicated to aggregates, which makes it difficult to ascertain whether or not there is a specific government aggregate resources management plan. This also makes it difficult to track down information on aggregates except through the SIGEOM search tool. This becomes increasingly difficult if one is not comfortable with the French language.

### **6.5 Reports/Publications**

Through the use of the SIGEOM database, reports and publications can be located and obtained online. There are various reports that contain geological, and aggregate information, however there does not seem to be a comprehensive series of reports about aggregates. Aggregate reports appear to have been completed “on an as needed basis” in response to a demand for a particular resource. The available aggregate reports and publications contain various attributes such as material type, thickness, area, volume, surficial drainage, overburden type and thickness.

## **6.6 References**

1. QUATERNARY GEOMORPHOLOGY OF THE QUEBEC NORTH SHORE, GODBOUT TO SEPT-ILES, 1977.

Authors: ARNAUD, BABEL, BEAUVAIS, BOURDON, CANNON, DE MONTS, FAFARD, FITZPATRICK, FLECHE, GODBOUT, GRENIER, LENEUF, LETELLIER, MOISIE, ROYER DREDGE, L A.

344 pages. Maps - 22G05, 22G06, 22G11, 22G14, 22J01, 22J02, 22J03, 22J07, 22J08, 22J09.

2: INVENTAIRE DES RESSOURCES EN GRANULATS DE LA REGION DE LA MOTTE, 2008.

Authors: RG 2007-03 CADILLAC, FIGUERY, LA MOTTE, LA PAUSE, MALARTIC, MANNEVILLE, PREISSAC, VILLEMONTTEL BRAZEAU, A.

31 pages. 1 map - 32D08.

3: INVENTAIRE DES RESSOURCES EN GRANULATS DE LA REGION DE BARRAUTE (32C05), 2007.

Author: BRAZEAU, A.

25 pages. 1 map - 32C05.

4: RESSOURCES MINERALES DE LA REGION DE MONTREAL, 2003.

Authors: BRISEBOIS, D.

65 pages. 2 maps covering 31G01, 31G08, 31G09, 31H03, 31H04, 31H05, 31H06, 31H11, 31H12.

5: REPORT ON MINERAL EXPLORATION ACTIVITIES IN QUEBEC, 2004

**Figure 1: Quebec Aggregate Resources – Architectural Stone Quarries**

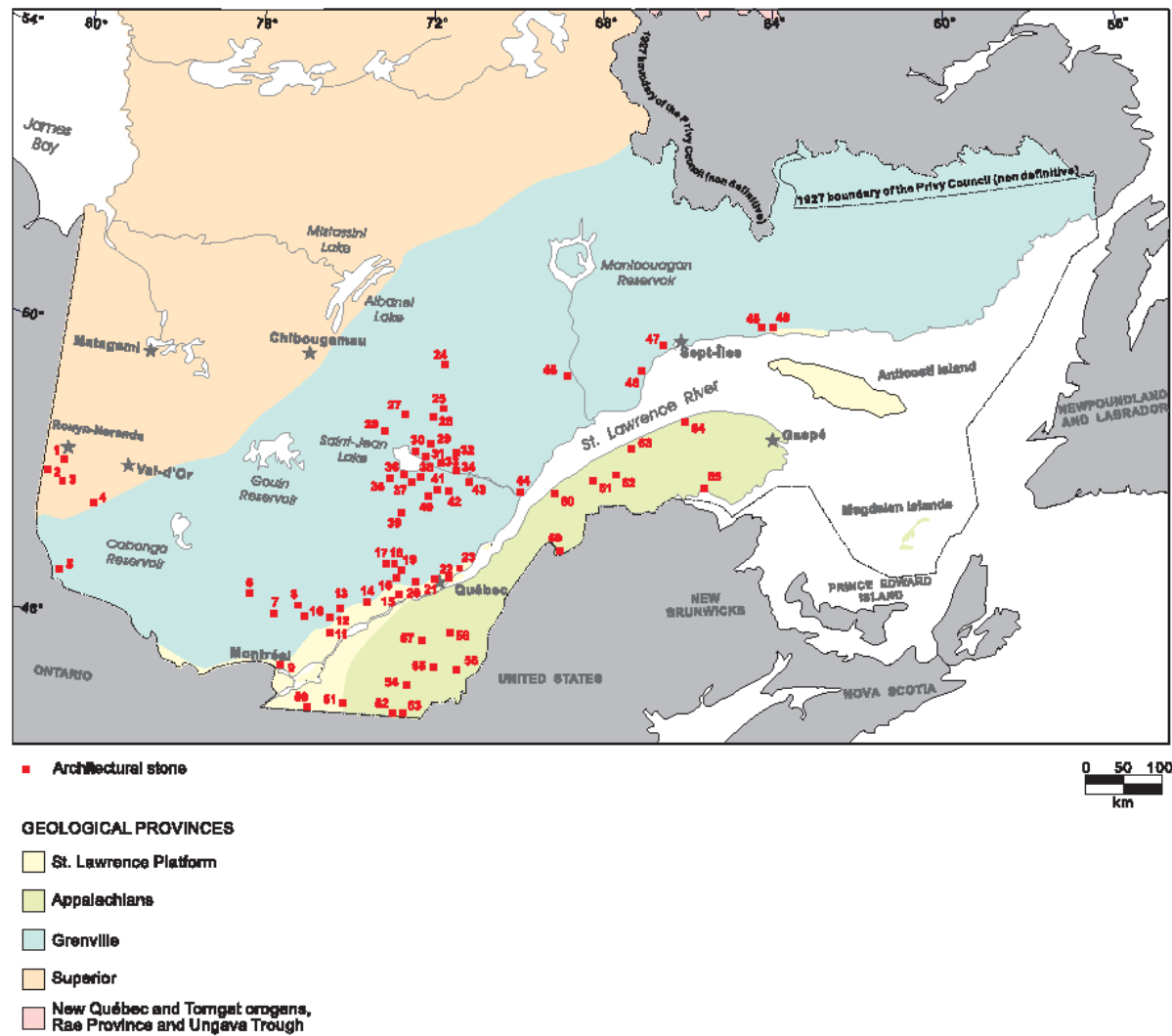


Figure II. Architectural stone quarries exploited in Québec for 2004 (for details, see table II).

Figure 2: Quebec Aggregate Resources – Peat Deposits, Industrial Minerals and Stone Quarries

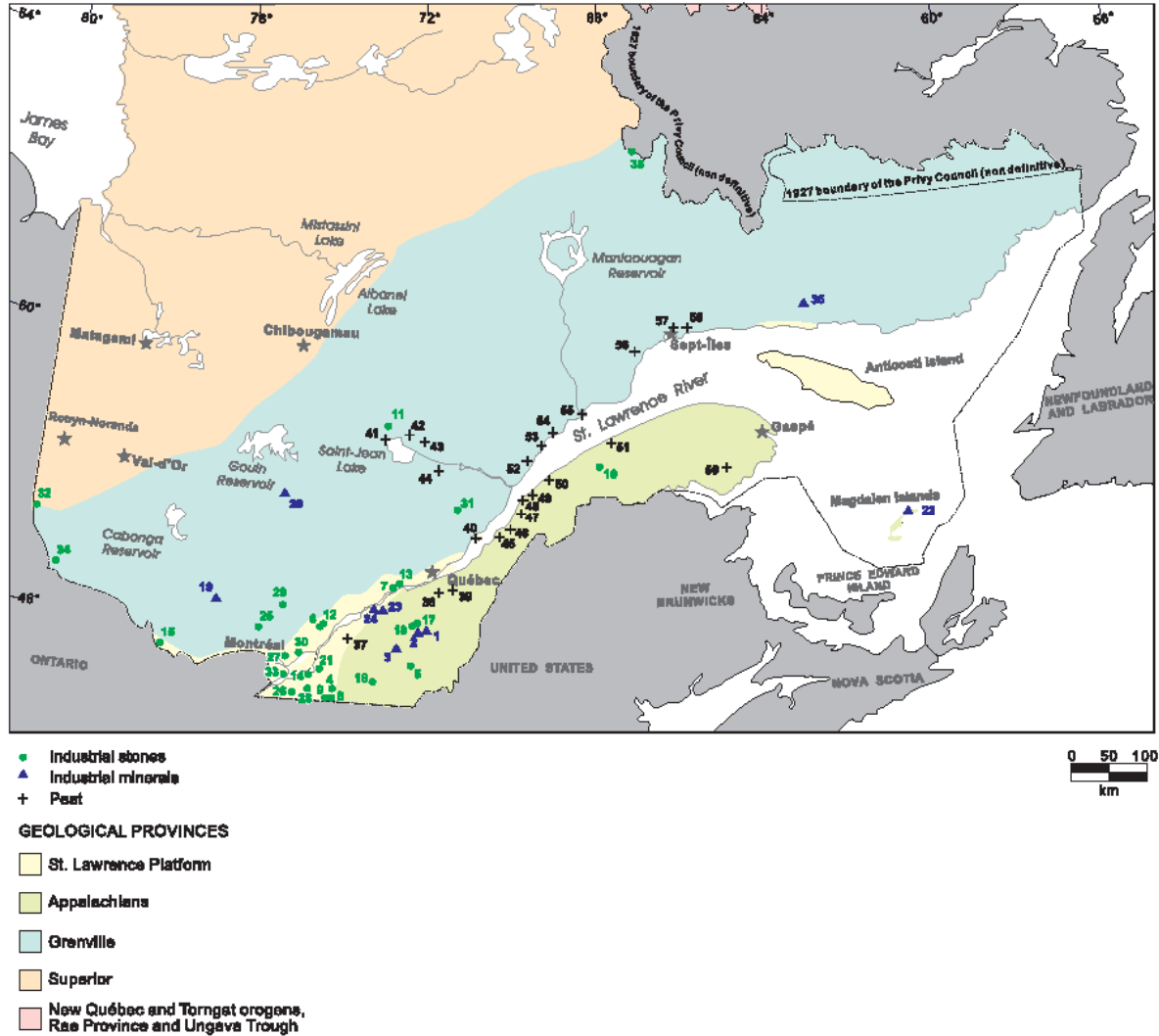


Figure III. Peat deposits, industrial minerals and stone quarries in production in Québec during 2004 (for details, see table III).



## Figure 3: Quebec Aggregate Resources – Mines

<http://www.mnr.gov.on.ca/MNR/aggregates/standards.html>

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Mineral Potential Map  
3D models  
Geoscience Work  
Geoscience Databases  
Outstanding geological sites (Available in French)

**One of the best places for mining investment**

- Take a look at the Québec Exploration 2008 Web site >>
- Consult the Molybdenum Bulletin published by Sidex >>

**Online Products and Services**

- E-Sigeom à la carte
- E-Sigeom Atlas
- E-Sigeom Examine
- GESTIM
- Directory of Mining Operators
- Mining Duties Return

For the past years, Québec, located in the northeastern part of North America, has been rated the most attractive jurisdiction in Canada for mineral exploration investment, according to the [Fraser Institute's](#) survey. Québec ranked 1<sup>st</sup> worldwide in 2007-2008, for its exploration investment attractiveness.

First of all, Québec has tremendous mineral potential, as indicated by the presence of several world-class ore deposits. Consisting of 90% Precambrian rocks, it is renowned for its

## Figure 4: Quebec Aggregate Resources – Geological Overview

<http://www.mrnfp.gouv.qc.ca/english/mines/quebec-mining/qc-mining-overview.jsp>

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# Highlights on the mines

[Home](#) > [The mines](#) > [Mining in Quebec](#) > ...

## Geological Overview

**Nearly 90% of Québec's bedrock is composed of Precambrian rocks of the Canadian Shield (north of the St. Lawrence River).** The remaining bedrock essentially consists of Paleozoic rocks that form the St. Lawrence Platform, along the shores of the St. Lawrence River, and the Appalachians, south of the river. These different environments offer interesting opportunities for exploration.

Map of the geological provinces ([PDF format, 99,6 kb](#))

The interpretation of Precambrian and Paleozoic rocks in eastern Canada has considerably evolved over the last few decades, thanks to a better understanding of geological and tectonic processes. For instance, an updated subdivision of geological provinces into subprovinces was developed. These subdivisions evolve as new geochronological data is released, particularly in the case of orogenic events that affected the Archean craton, which is a major component of the Shield.

The **Superior Province** (4 to 2.5 Ga) forms a large portion of the North American continent, and covers a third of Québec's landmass, i.e. a surface area of 600,000 km<sup>2</sup>. This geological province forms the central part of the Canadian Shield. It is world-renowned for its numerous copper, gold, zinc, nickel, silver and iron deposits. More recently, it was also the site of important discoveries of diamond occurrences.

Moreover, it is subdivided into about a dozen subprovinces, half of which are located in Québec. The most famous one is the Abitibi Subprovince, the largest Archean volcano-sedimentary belt in the world, renowned for its copper, zinc, silver and gold deposits. Rocks of the Superior Province are bounded to the east by the tectonic mobile zone of the Trans-Hudson Orogen, and to the southeast by the Grenville Province.

The **Churchill Province** (2.1 to 1.75 Ga) covers a surface area of about 150,000 km<sup>2</sup> in northern Québec, northeast of the Superior Province. It is characterized by four zones:

- The Ungava Orogen (Ungava Trough), which borders the Superior Province to the

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- [E-Sigcom Atlas](#)
- [E-Sigcom Examine](#)

## Figure 5: Quebec Aggregate Resources – Exploration Rights

<http://www.mrnfp.gouv.qc.ca/english/mines/rights/rights-exploration.jsp>

The screenshot shows the 'Mines' section of the Quebec government website. The navigation bar at the top includes links for Wildlife, Energy, Forests, Mines (highlighted), Territory, Land Survey, and Department. The main heading is 'Highlights on the mines'. The breadcrumb trail reads 'Home > The mines > Mining rights > ...'. The page title is 'Exploration Rights'. A sidebar on the left lists various topics under 'Mining Rights', including 'Exploration Rights', 'Exploration and Land Reserved to the State', 'Extraction Rights', 'Conversion, Replacement and Amalgamation', 'Mining title management system (Gestim)', 'Québec Mining Maps Available in French', 'Mine Rehabilitation', 'Investment and Fiscal Support', 'Mining Industry', 'Publications and Speeches', and 'Press Room'. The main content area features a photograph of a mining site and a text box stating: 'The claim is the only valid exploration right in Québec. The claim gives the holder an exclusive right to search for mineral substances in the public domain, except sand, gravel, clay and other loose deposits, on the land subjected to the claim.' Below this, a paragraph explains that the term of a claim is two years, from the day the claim is registered and it can be renewed indefinitely providing the holder meets all the conditions set out in the Mining Act, including the obligation to invest a minimum amount required in exploration work determined by regulation. The Act includes provisions to allow any amount disbursed to perform work in excess of the prescribed requirements to be applied to subsequent terms of the claim. Another paragraph states that the online publication 'Claims' describes the procedure for obtaining and renewing a claim, along with the requirements relating to the compulsory work that must be carried out on each claim. A list of links is provided: 'Fees for exploration rights', 'Forms', 'Directives', and 'GESTIM'. The bottom left corner has a section for 'Online Products and Services' with links to 'e-sigéom à la carte', 'e-sigéom atlas', 'e-sigéom examine', 'GESTIM', and 'Mining Duties Return'. The bottom right corner has a 'What's new?' section.

Wildlife Energy Forests **Mines** Territory Land Survey Department

Highlights on the mines

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### Exploration Rights

**The claim is the only valid exploration right in Québec.**  
The claim gives the holder an exclusive right to search for mineral substances in the public domain, except sand, gravel, clay and other loose deposits, on the land subjected to the claim.

The term of a claim is two years, from the day the claim is registered and it can be renewed indefinitely providing the holder meets all the conditions set out in the *Mining Act*, including the obligation to invest a minimum amount required in exploration work determined by regulation. The Act includes provisions to allow any amount disbursed to perform work in excess of the prescribed requirements to be applied to subsequent terms of the claim.

The online publication [Claims](#) describes the procedure for obtaining and renewing a claim, along with the requirements relating to the compulsory work that must be carried out on each claim.

- [Fees for exploration rights](#)
- [Forms](#)
- [Directives](#)
- [GESTIM](#)

Geology

**Mining Rights**

Exploration Rights  
Exploration and Land Reserved to the State  
Extraction Rights  
Conversion, Replacement and Amalgamation  
Mining title management system (Gestim)  
Québec Mining Maps Available in French

Mine Rehabilitation

Investment and Fiscal Support

Mining Industry

Publications and Speeches

Press Room

Online Products and Services

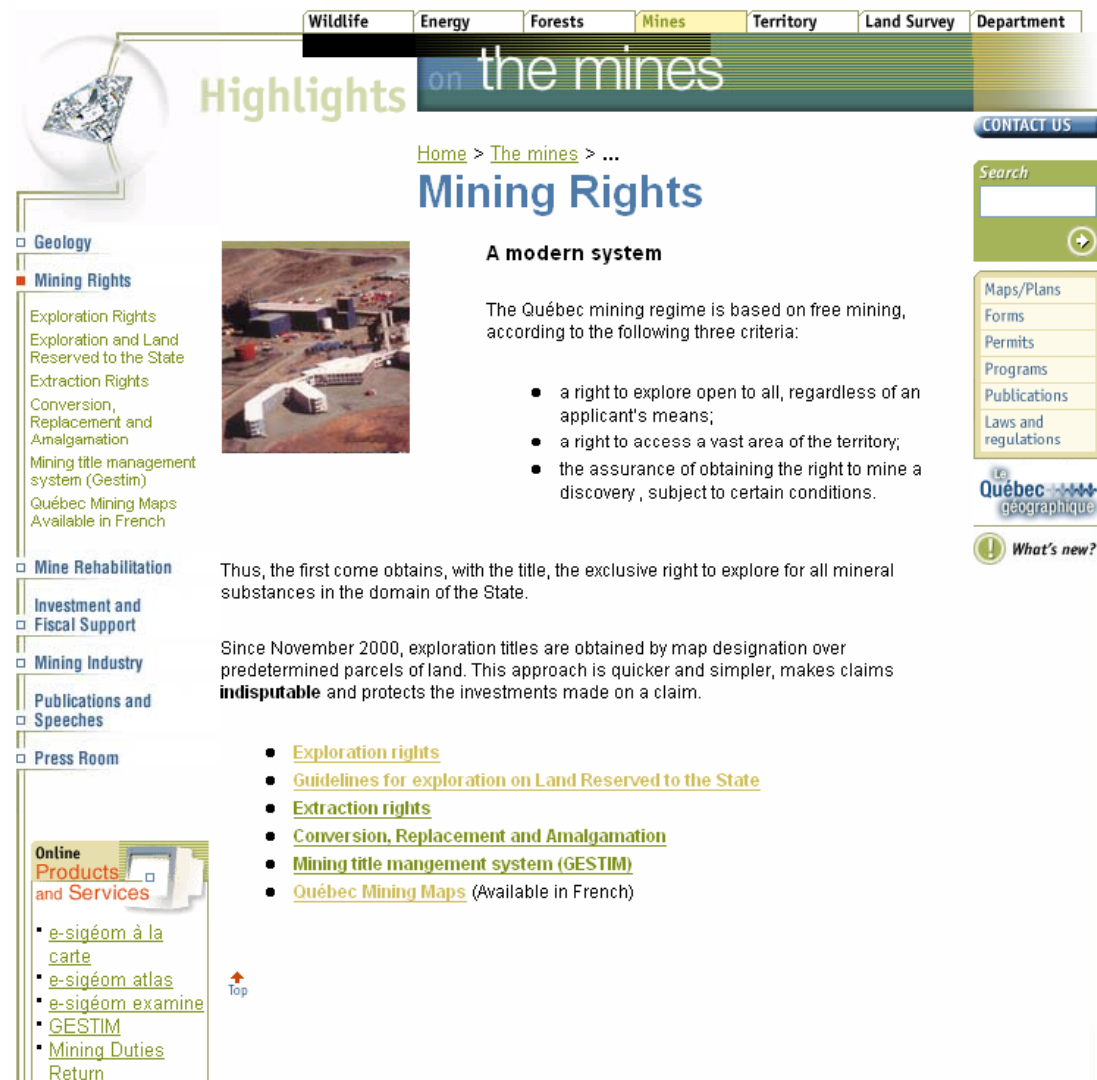
- [e-sigéom à la carte](#)
- [e-sigéom atlas](#)
- [e-sigéom examine](#)
- [GESTIM](#)
- [Mining Duties Return](#)

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What's new?

## Figure 6: Quebec Aggregate Resources – Mining Rights

<http://www.mrnfp.gouv.qc.ca/english/mines/rights/index.jsp>



The screenshot shows the 'Mining Rights' page on the Quebec government website. At the top, a navigation bar includes links for Wildlife, Energy, Forests, Mines (highlighted), Territory, Land Survey, and Department. Below this is a banner with the text 'Highlights on the mines'. The main heading is 'Mining Rights', preceded by a breadcrumb trail: 'Home > The mines > ...'. To the left is a vertical menu with categories: Geology, Mining Rights (selected), Mine Rehabilitation, Investment and Fiscal Support, Mining Industry, Publications and Speeches, and Press Room. Under 'Mining Rights', sub-links include Exploration Rights, Exploration and Land Reserved to the State, Extraction Rights, Conversion, Replacement and Amalgamation, Mining title management system (GESTIM), and Québec Mining Maps Available in French. A small image of a mining site is shown next to the 'A modern system' section. This section states that the Québec mining regime is based on free mining and lists three criteria: a right to explore open to all, a right to access a vast area of the territory, and the assurance of obtaining the right to mine a discovery. Below this, a paragraph explains that since November 2000, exploration titles are obtained by map designation over predetermined parcels of land, making claims indisputable. A list of links follows: Exploration rights, Guidelines for exploration on Land Reserved to the State, Extraction rights, Conversion, Replacement and Amalgamation, Mining title management system (GESTIM), and Québec Mining Maps (Available in French). On the right side, there is a 'CONTACT US' button, a search box, and a list of links: Maps/Plans, Forms, Permits, Programs, Publications, Laws and regulations, and a 'What's new?' section with an exclamation mark icon. At the bottom left, there is a section for 'Online Products and Services' with links to e-sigéom à la carte, e-sigéom atlas, e-sigéom examine, GESTIM, Mining Duties, and a Return link. A small 'Top' button with an upward arrow is also present.

Wildlife Energy Forests **Mines** Territory Land Survey Department

Highlights on the mines

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Home > The mines > ...

### Mining Rights

**A modern system**

The Québec mining regime is based on free mining, according to the following three criteria:

- a right to explore open to all, regardless of an applicant's means;
- a right to access a vast area of the territory;
- the assurance of obtaining the right to mine a discovery, subject to certain conditions.

Thus, the first come obtains, with the title, the exclusive right to explore for all mineral substances in the domain of the State.

Since November 2000, exploration titles are obtained by map designation over predetermined parcels of land. This approach is quicker and simpler, makes claims **indisputable** and protects the investments made on a claim.

- [Exploration rights](#)
- [Guidelines for exploration on Land Reserved to the State](#)
- [Extraction rights](#)
- [Conversion, Replacement and Amalgamation](#)
- [Mining title management system \(GESTIM\)](#)
- [Québec Mining Maps](#) (Available in French)

**Online Products and Services**

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- [e-sigéom examine](#)
- [GESTIM](#)
- [Mining Duties](#)
- [Return](#)

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# Figure 7: Quebec Aggregate Resources – Geoscience Database

<http://www.mrnfp.gouv.qc.ca/english/mines/geology/geology-databases.jsp>

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et Faune  
**Québec**

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Wildlife Energy Forests **Mines** Territory Land Survey Department

Highlights on the mines

Home > The mines > Geology > ...

## Geoscience Databases

You will now access SIGEOM, a unique spatially referenced geomining information system. This system contains all the geoscience data accumulated in Québec over the last 150 years. Each year, it is enriched with the results of prospecting and exploration work carried out by the Department, mining companies and universities.

**It encompasses:**

- [e-sigeom à la carte](#), which provides access to all geoscience data. It allows users to search for data based on specific criteria, and to obtain customized maps in the desired format.
- [e-sigeom atlas](#), which makes it easy to access all available GIS products. It lists all geological, geochemical or geophysical maps.
- [e-sigeom examine](#), which lists all the geoscience documentation available at the Department:
  - bibliographic data from the documentary database;
  - reports;
  - maps.

With Sigeom, you can consult, find and order the products you need. Commercial transactions are performed in a secure environment.

**Online Products and Services**

- [e-sigeom à la carte](#)

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**Geology**  
Hot Spots  
Geological overview  
Mineral Potential Map  
3D Models  
Geoscience Work  
**Geoscience Databases**  
Outstanding geological sites (Available in French)  
Mining Rights  
Mine Rehabilitation  
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## Figure 8: Quebec Aggregate Resources – SIGEOM Categories

[http://sigeom.mrnfp.gouv.qc.ca/signet/classes/I1102\\_indexAccueil?l=a](http://sigeom.mrnfp.gouv.qc.ca/signet/classes/I1102_indexAccueil?l=a)

**Géologie Québec - Sigéom à la carte - Microsoft Internet Explorer**

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites Links Go

Address [http://sigeom.mrnfp.gouv.qc.ca/signet/classes/I1102\\_indexAccueil?l=a](http://sigeom.mrnfp.gouv.qc.ca/signet/classes/I1102_indexAccueil?l=a)

**Ressources naturelles et Faune Québec**

**e-sigeom à la carte**

español français confidentiality policy Help

**Examine document (and surveys)** ? The Examine documents (and surveys) constitute the gateway to the Géologie Québec record holdings. They represent the overall available information describing the content of the report, in addition to locating the work perimeter.

**Access small scale maps** ? The projects of small scale maps are directed towards the creation of document of generalization on scales smaller than the 1: 250 000 supplied with the base given of the SIGEOM. They are projects of synthesis or models geological. They can be also used for Promotion of the mineral potential and the geoscientific promotion of the inheritance like the exceptional geological sites.

+ Geology

+ Geophysics

+ Geochemistry

- Deposits

**Construction materials and industrial stones** ? This product includes deposits or quarries of architectural stone, crushed stone and industrial stone. Architectural stone includes construction stone and ornamental stone. Crushed stone includes all forms of aggregates. Industrial stone includes all stone exploited for industrial purposes which requires no (or little) transformation.

**Nonmetallic deposit** ? Non-metal deposits are geologic bodies that contain one or more minerals or substances liable to be exploited. They include : most industrial minerals precious stones

**Metallic deposit (Mineralized body)** ? Metallic deposits provide information on ore bodies having at least one of the metallic substances with a content above the prescribed threshold.

+ Glacial transport

+ Quaternary geology

+ Drilling

+ Hydrogeology

**Québec**

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javascript:go("PT","O") Internet



## Figure 9: Quebec Aggregate Resources – Search Criteria

[http://sigeom.mrnfp.gouv.qc.ca/signet/classes/I1102\\_index](http://sigeom.mrnfp.gouv.qc.ca/signet/classes/I1102_index)

Géologie Québec - Building the query - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites Go

Address [http://sigeom.mrnfp.gouv.qc.ca/signet/classes/I1102\\_index](http://sigeom.mrnfp.gouv.qc.ca/signet/classes/I1102_index) Go

Resources naturelles et Forêts Québec

e-sigeom à la carte

Building the query

Query 1

Search

New query

History

Checkout

Help

### Construction materials and industrial stones

NTS MAP-SHEET NUMBER	is equal to		> Values
REGIONAL COUNTY MUNICIPALITY (RCM)	is equal to		> Values
NAME OF DEPOSIT OR QUARRY	is equal to		
COMMERCIAL NAME GIVEN TO ARCHITECTURAL STONE	is equal to		
DEPOSIT OR QUARRY STATUS	is equal to		> Values
PROVENANCE	is equal to		> Values
DATE OF FIELD TRIP	is equal to		
VOLUME EXTRACTED	is equal to		
WORK HISTORY	includes		
COMMENT - SOURCE ACCESS	includes		
COMMENT - LOCATION	includes		
GEOLOGICAL DESCRIPTION	includes		
COMMENT - USE OF EXTRACTED PRODUCT	includes		
COMPILATION DATE	is equal to		

### Substance

SUBSTANCE	is equal to		> Values
-----------	-------------	--	----------

### Product extracted

EXTRACTED PRODUCT	is equal to		> Values
-------------------	-------------	--	----------

### Use of the product extracted

USE OF EXTRACTED PRODUCT	is equal to		> Values
--------------------------	-------------	--	----------

### Architectural stone color

COLOR	is equal to		> Values
-------	-------------	--	----------

### Search territory

CUSTOMIZED TERRITORY	> Define		> Values
----------------------	----------	--	----------

Québec

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Internet

## **7.0 New Brunswick Aggregate Resources**

### **7.1 Aggregate Ownership**

#### **Private Land**

Regulatory control of aggregate extraction on private lands is variable. There does not appear to be any regulatory control if the land grants included the sand and gravel or minerals rights. There is a notable exception and that relates to land that lies within 300 metres (above or below high tide mark of the shoreline).

#### **Crown Land**

[The Mining Act](#) (S1.1(1) states that in all grants in the province where the mines and minerals have been reserved to the Crown, then all the sand, gravel and clay minerals are property separate from the soil and ownership of such minerals is vested in the Crown. The effect of this clause is to vest the sand and gravel rights in the Crown, unless the land Grant specifically included rights to the minerals or sand and gravel.

[The Mining Act](#) (S1.1(2) specifies that all sand, gravel, clay and soil taken from Crown Lands and used or to be used for their chemical or special physical properties, or both, or taken for contained minerals, are minerals and therefore subject to the Mining Act.

In New Brunswick, the Minister of the Department of Natural Resources, through the [Quarriable Substances Act](#) and Regulation 93-92, controls the extraction of all quarriable substances on Crown lands and that area of the shoreline that lies within 300 metres above and 300 metres below the ordinary high water mark.

### **7.2 Legislation**

In New Brunswick, [The Mining Act](#) (S1.1(1) and S1.1(2) have been described above and outline the Crown ownership of sand and gravel and other minerals.

In addition, the Minister of the Department of Natural Resources, through the [Quarriable Substances Act and Regulation 93-92](#) controls the extraction of all quarriable substances on Crown lands and that area of the shoreline that lies within 300 metres above and 300 metres below the ordinary high water mark.

Crown land aggregate materials in New Brunswick may be acquired by one of the following regulatory procedures:

[Written Authorization](#) - applies to extraction from existing pits and quarries for amounts less than 1000 tonnes for a period not exceeding 30 days.

[Quarry Permit](#) - applies to extraction from new or existing pits or quarries for a period ending on December 31st of the same year of issue.



Quarry Lease - a third procedure available to acquire the rights to Crown land quarriable substances. It differs from the authorization and permitting process in that a lease will provide a company exclusive rights to a pit or quarry located on Crown land. The term of the lease can vary up to a maximum term of ten years. To secure a quarry lease, the company must be able to demonstrate the need for exclusive use (i.e., to secure their investment in equipment, etc.).

### **7.3 Departmental Responsibility for Aggregates**

The Quarriable Substances Act provides the Minister of Natural Resources with the authority to manage tenure, exploration, development and production of quarriable substances on Crown Lands. Quarriable substances include ordinary stone, building or construction stone, sand, gravel, peat, clay and soil.

The Act also allows the Minister to designate shore areas lying outside Crown Lands to be subject to the Act.

### **7.4 Granular Resource Inventories**

The index map of New Brunswick Granular Aggregate Inventory Program (Figure 1 and Figure 2) can be accessed at weblink:

[http://www.gnb.ca/0078/minerals/Surficial\\_Mapping\\_Granular-e.asp](http://www.gnb.ca/0078/minerals/Surficial_Mapping_Granular-e.asp)

The program was initiated in 1974 in order to outline alternative sources for concrete sand in the Moncton area, which would be significantly impacted by the impending (April 1, 1975) closure of provincial beaches to aggregate extraction activities. The inventory program was subsequently extended to the remainder of the province. The field mapping and sampling part of the program was completed in 1986.

### **Methodology**

Mapping was based on the federal 1:50 000 scale National Topographic System maps for the province. There were three components to the inventory process:

- 1) Office work such as airphoto interpretation to identify landforms (surficial classification) and potential deposits;
- 2) Field Work including surficial mapping, test pits and sampling; and
- 3) Laboratory Work such as grain size or petrographic analyses.

Reports consisted of:

- 1) Brief description of the bedrock and surficial geology of the study area;
- 2) Description of the types and general characteristics of the granular aggregate deposits
- 3) Appendices containing section descriptions, the results of grain-size and lithological analyses and;

- 4) Estimated recoverable reserve volumes for each specific deposit.

Map coverage (Figure 1) is available for all of New Brunswick's granular aggregate resource area at a NTS - 1:50,000 scale. This is equivalent to 94 full and partial map sheets. The number of samples collected per map sheet averages 26 per sheet but for some sheets up to 75 samples were collected and analysed. Geotechnical data, including grain size sieve analysis and other related information such as petrographic values is available for 2413 sample sites. Resource estimates are provided for 1800 sites, but the estimates are approximate.

### **Surficial Geology Maps**

Surficial maps and reports (Figure 3) include data about the physical and chemical composition of soil, glacial till, sand and gravel, and weathered bedrock. This information plays a significant role in aggregate and mineral exploration industrials.

The Geological Surveys Branch (GSB) of the Department of Natural Resources oversees the Government's surficial geology program. The program's key objective is to provide the surficial geology framework for mineral exploration and land use management in New Brunswick. To meet this objective, the GSB:

- produces 1:50 000-scale maps showing the distribution of surficial materials and landforms in New Brunswick;
- conducts geochemical surveys of till, soil, stream sediment, water, humus and vegetation;
- locates and investigates sand and gravel deposits; and
- provides Government and the private sector with data and advice applicable to hydrogeological studies, environmental assessment, land use planning, and other aspects of landscape management.

### **Bedrock Aggregate Resources Data**

Bedrock aggregate resource mapping is available for about 40% of the province (equivalent to 39 full or partial NTS 1:50 000 scale sheets). Bedrock sample sites per map sheet can varied from 2 to 65 (average 8) depending on geology and proximity to a primary market demand area. Data is available for 750-bedrock sample sites and includes basic engineering data at most sites. Average number of samples per sheet would be 8."

## **7.5 Public Access and Availability to Data**

### **Reports/Publications**

Reports and publications are available for including:

- Granular Aggregate Inventory Maps (Figure 1);
- Granular Aggregate Inventory Reports (Figure 2); and
- Surficial Geology Maps (Figure 3),

Report attribute data includes: deposit material type, thickness, area, volume, surficial drainage, overburden type and thickness, etc.).

A summary map of Surficial Geology (Figure 4) at a scale of 1:500,000 can be viewed in pdf format at Weblink:

[http://www.gnb.ca/0078/minerals/pdf/Surficial\\_Mapping\\_NR\\_8.pdf](http://www.gnb.ca/0078/minerals/pdf/Surficial_Mapping_NR_8.pdf).

Similarly, a summary map of Bedrock Geology (Figure 5) at a 1:500,000 scale can be viewed in pdf format at Weblink:

[http://www.gnb.ca/0078/minerals/pdf/Bedrock\\_Geology\\_MapNR1-e.pdf](http://www.gnb.ca/0078/minerals/pdf/Bedrock_Geology_MapNR1-e.pdf)

### **Atlas of Granular Aggregate Resources**

The "Atlas of Granular Aggregate Resources, New Brunswick" was published in 1987 following the completion of the Provincial aggregate inventory. This atlas comprises simplified (summary) aggregate maps at 1:100 000 scale. Each map corresponds to an individual NTS map, or to parts of two or more maps. Cross-referencing to the corresponding aggregate report(s) and accompanying map(s) is provided. The atlas includes a reference list of all Granular Aggregate Inventory Reports.

### **On-Line Databases**

A Number of geoscience databases are available online, including: Bedrock core and Borehole information, Mineral Occurrences and Granular Aggregate Resources.

The Granular Aggregate Database at Weblink

<http://www1.gnb.ca/0078/GeoscienceDatabase/GranularAgg/GranAgg-e.asp>

(Figure 6) can be used to retrieve information on the granular deposits including: Description, Sound and Unsound Lithologies, CSA and ASTM Engineering Testing and Sieve analyses. The Search engine can be refined based on Deposit Type, Exposure Type and NTS Map Sheet.

Access to publications via the website is possible by via the standard search engine "PARIS" (Figure 7), or by selecting the desired map sheet from the online index map (Figure 8). While the indexes can be viewed and downloaded from the website, the reports and maps themselves cannot be downloaded and must be purchased separately.

## **7.6 References**

1. Title: New Brunswick Department of Natural Resources

Author: n/a

Product No.:

Ministry Reference:

Category: Miscellaneous

Format: Atlas of granular aggregate resources, New Brunswick, Miscellaneous Report 6, 90 p

Additional Information: Quarriable Substances Technician, Resource Development

[http://www.gnb.ca/0078/minerals/Surficial\\_Mapping\\_Granular-e.asp](http://www.gnb.ca/0078/minerals/Surficial_Mapping_Granular-e.asp)

2. Title: New Brunswick Granular Aggregate Inventory Report Coverage

Author: n/a

Product No.:

Ministry Reference:

Category: Miscellaneous/ New Brunswick Geological Survey Branch

Format: Digital

Additional Information:

[http://www.gnb.ca/0078/minerals/Surficial\\_Mapping\\_Granular-e.asp](http://www.gnb.ca/0078/minerals/Surficial_Mapping_Granular-e.asp)

3. Title: Generalized Surficial Geology Map of New Brunswick

Author: n/a

Product No.:

Ministry Reference:

Category: Miscellaneous

Format: Digital

Additional Information: New Brunswick Department of Natural Resources and Energy

[http://www.gnb.ca/0078/minerals/Surficial\\_Mapping\\_Granular-e.asp](http://www.gnb.ca/0078/minerals/Surficial_Mapping_Granular-e.asp)

4. Title: Bedrock Geology of New Brunswick

Published by: R.R. Irrinki, Director of New Brunswick Geological Survey Branch

Product No.:

Ministry Reference: Map NR-1

Category: Miscellaneous

Format: Digital

Additional Information: New Brunswick Department of Natural Resources and Energy and New Brunswick Geological Survey

[http://www.gnb.ca/0078/minerals/Surficial\\_Mapping\\_Granular-e.asp](http://www.gnb.ca/0078/minerals/Surficial_Mapping_Granular-e.asp)

Figure 1: New Brunswick – Granular Aggregate Inventory Map Coverage

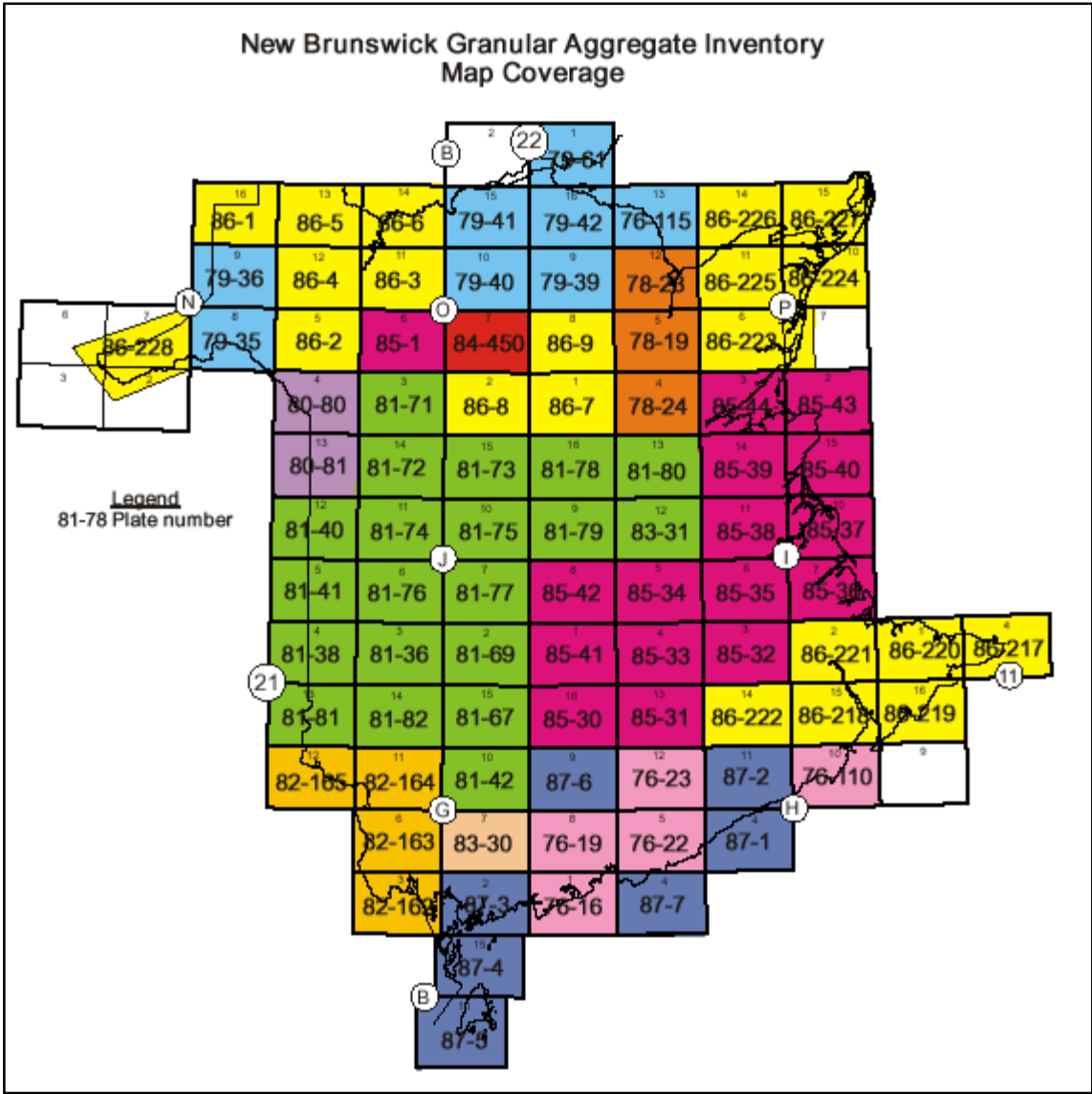


Figure 2: New Brunswick – Granular Aggregate Inventory Report Coverage

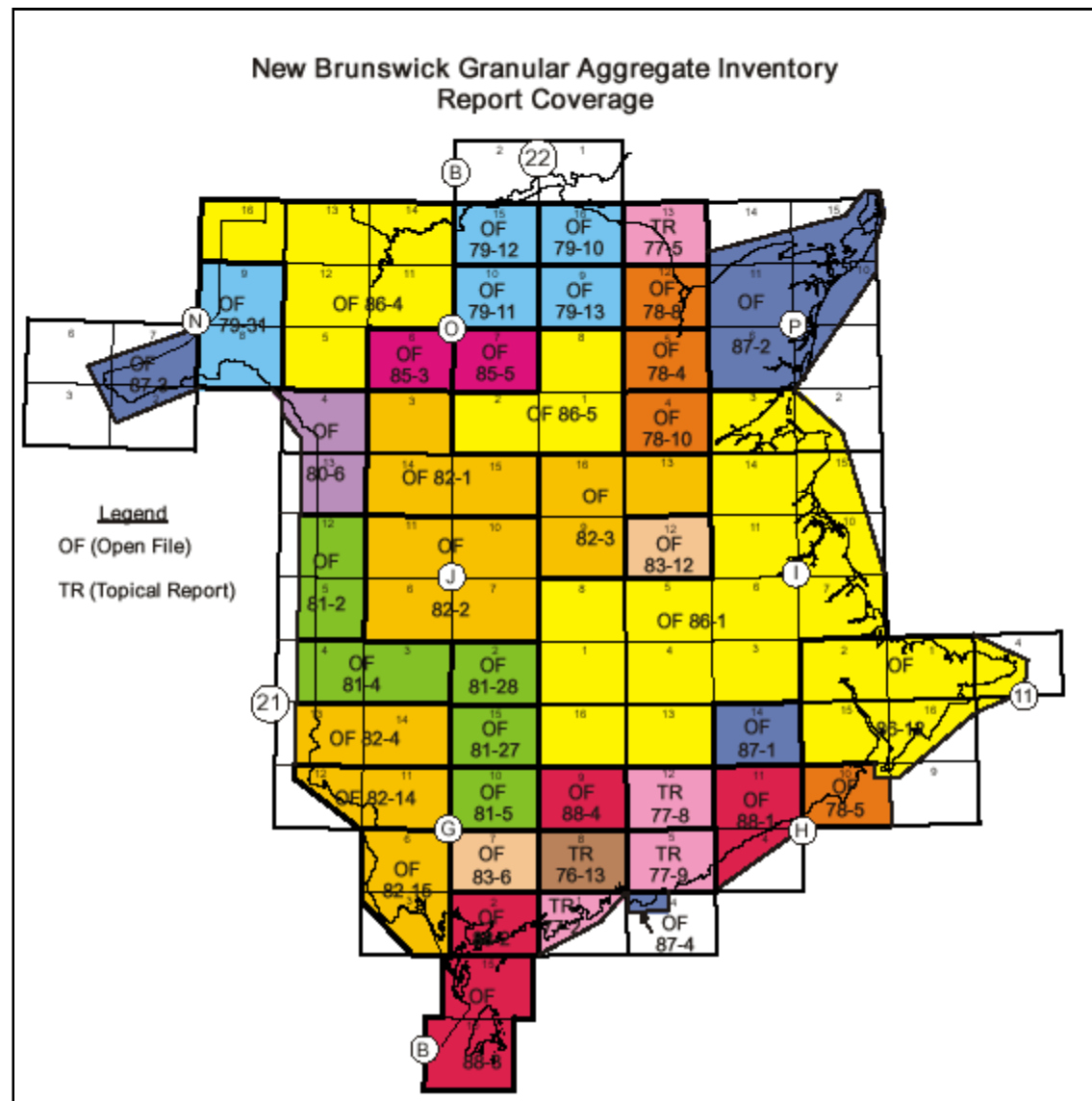


Figure 3: New Brunswick Index Map – Available Surficial Geology Maps

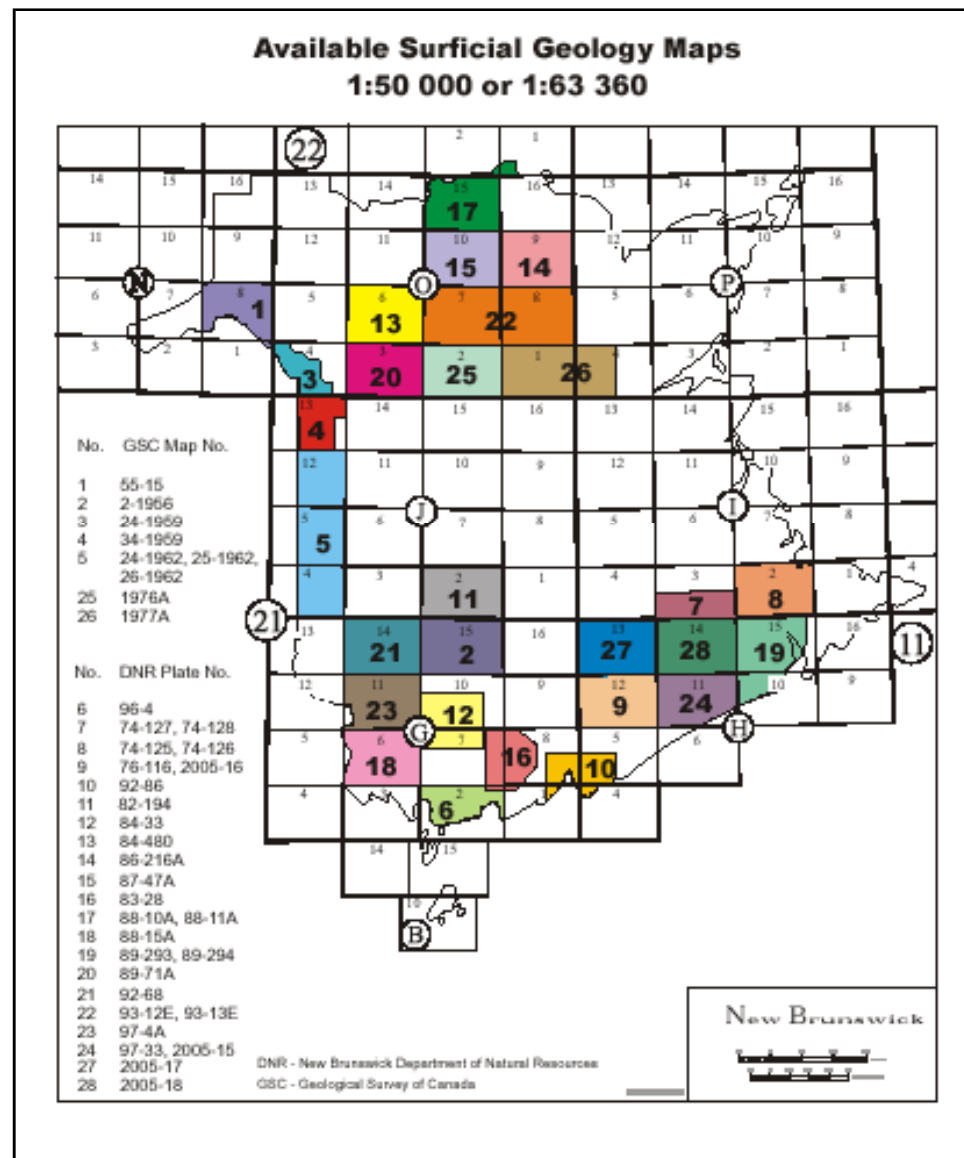


Figure 4: New Brunswick Surficial Geology 1:500,000 Scale

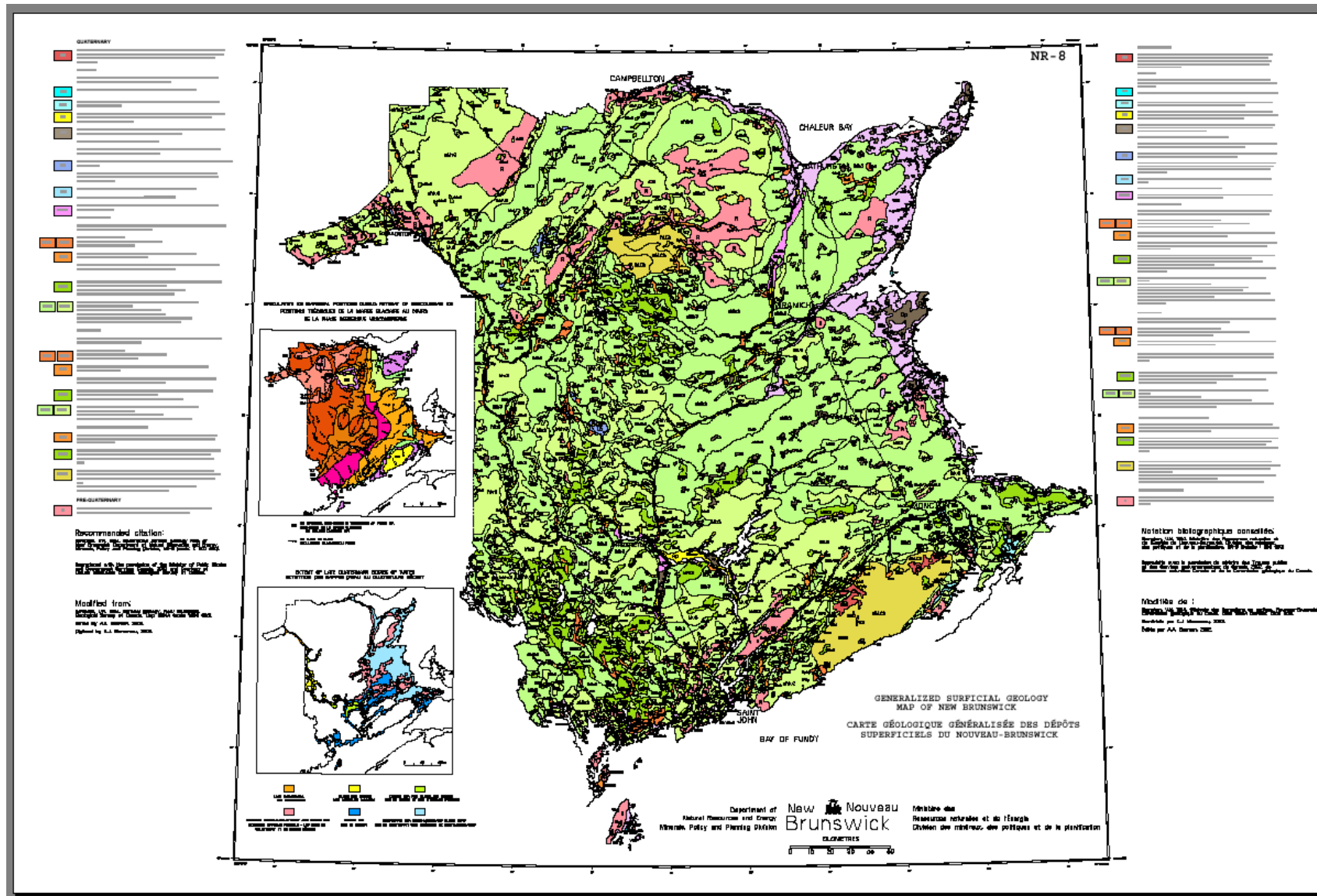




Figure 5: New Brunswick Bedrock Geology 1:500,000 Scale

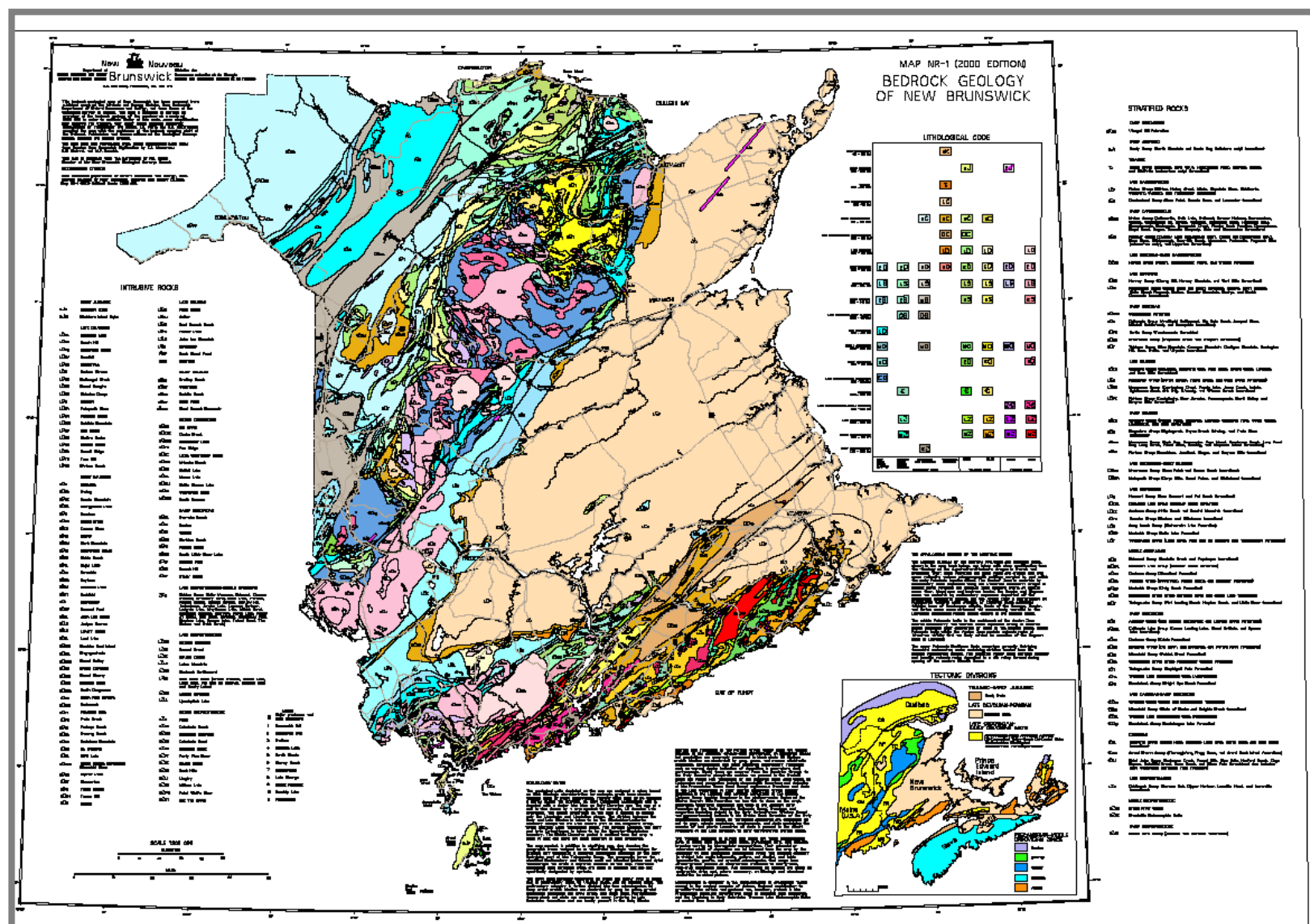


Figure 6: New Brunswick Granular Aggregate Database

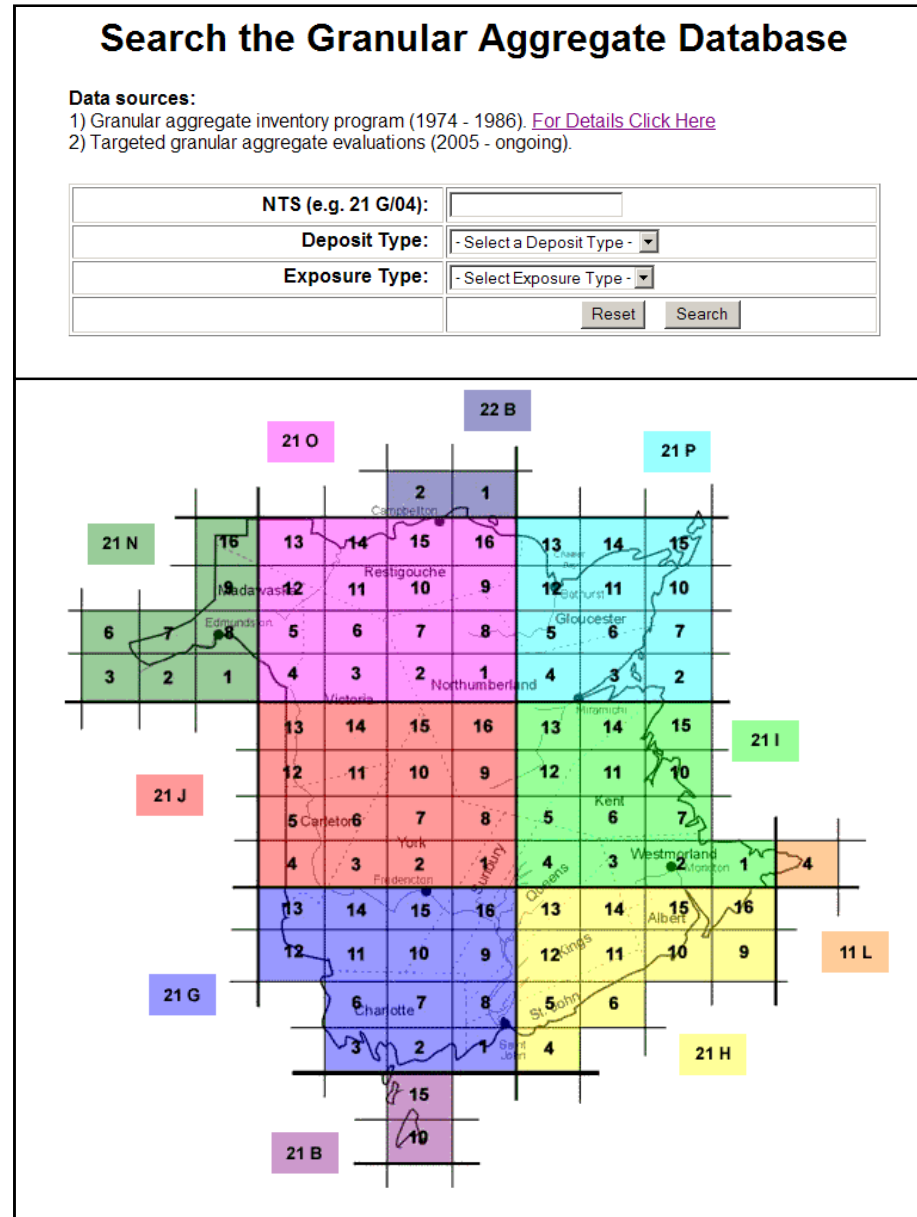



Figure 7: New Brunswick Publications Search - PARIS



[Home](#) | [Français](#)

[PARIS Home](#) | [Help](#)

### PARIS - Publication Search Criteria

- Enter or select search criteria in one or more of the following fields
- You can use the percent sign (%) as a wild-card character for text fields (except for work performed and year submitted). For example: Sm% will match any entries beginning with Sm (i.e., Smythe, Smith, Smit, etc.) and %Brunswick% will match any entries containing brunswick.
- Searches are not case sensitive.

Publication Number:

Publication Source:

Publication Type:

Title:

Author Last Name:

NTS (e.g. 21G/06%,  
21P/12W)


Publication Year:

from  to

Submit

Reset

Figure 8: New Brunswick Publications Search by NTS



**New Brunswick**  
CANADA

[Home](#) | [Français](#)

---

**Natural Resources**

**Minerals & Petroleum Resources**

**Geology & Exploration**

[Bedrock Mapping](#)

[Surficial Mapping](#)

[Metallic Mineral Deposits](#)

[Industrial Mineral Deposits](#)

[Hydrocarbon Basin Analysis](#)

[Geophysics](#)

[Geochemistry](#)

[Coastal Studies](#)

[Drill Core & Cuttings](#)

**Minerals & Petroleum (Regulatory)**

[Legislation & Policy](#)

[Mining Resources](#)

[Petroleum Resources](#)

[Peat](#)

[Aggregate](#)

[Prospecting](#)

[Forms](#)

[Calendar of Events](#)

[Photo Gallery](#)

**Services**

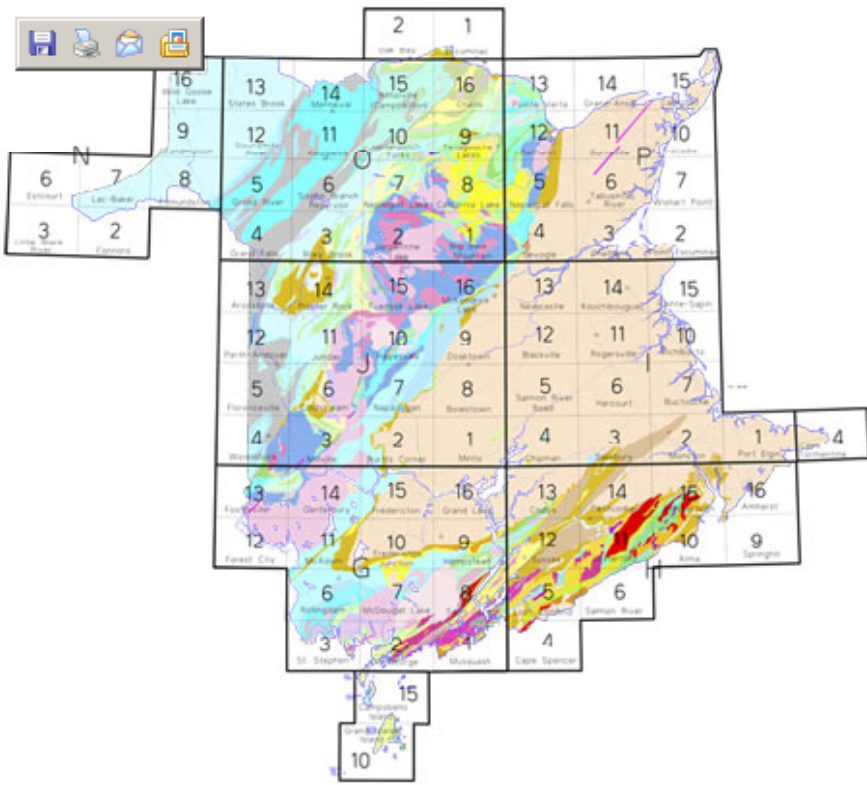
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[Databases](#)

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NTS INDEX OF PUBLICATIONS

([Search PDF List](#)) ([Search PARIS](#))



## **8.0 Nova Scotia Aggregate Resources**

### **8.1 Aggregate Ownership**

#### **Private Land**

Under the Nova Scotia Mineral Resources Act, sand, gravel and stone (including building stone) are not Crown minerals. In order to open and operate a sand/gravel pit or a crushed rock quarry, the surface rights for the property must be held by the owner/operator of the quarry or arrangements must be made with the landowner to develop the pit or quarry. All other minerals are reserved to the Crown.

#### **Crown Land**

On lands owned by the Crown, the Nova Scotia Department of Natural Resources is responsible for the administration of sand, gravel, stone and minerals.

### **8.2 Legislation**

Establishment of pits or quarries on private land is subject to the approval of the Nova Scotia Department of the Environment. Regulation of health and safety procedures in an operating pit or quarry is the responsibility of the Nova Scotia Department of Labour.

Under the *Crown Lands Act*, a permit is needed for the removal, for commercial sale, of more than 5,000 cubic metres, or 7,000 metric tonnes, of inland aggregate (fill, gravel, class 'A' gravel, sand, riprap stone, armour stone, and marble chips) from Crown Lands in Nova Scotia.

Pits and Quarries on Crown Land are regulated under the Mineral Resources Act in Nova Scotia and various permits and licences include:

- Nova Scotia Inland Aggregate Removal Permit (for more than 5,000 cubic metres or 7,000 metric tonnes)
- Nova Scotia Inland Aggregate Removal Permit (for not more than 5,000 cubic metres or 7,000 metric tonnes)
- Nova Scotia Beach Aggregate Removal Permit (for not more than 10 cubic yards)
- Limestone extraction from Crown Lands requires a Mineral Extraction Licence

### **8.3 Resource Management (Land Use Planning)**

The management of Aggregate Resources on Crown Land in Nova Scotia is the responsibility of the Nova Scotia Department of Natural Resources Mineral Resources Branch as set out at Weblink: <http://www.gov.ns.ca/natr/meb/ic/ic20.htm> - 10

On private land, operation of a pit or quarry requires that permission be obtained from the Nova Scotia Department of the Environment. Regulation of health and safety procedures of an operating pit or quarry is the responsibility of the Nova Scotia Department of Labour. (See Mineral Rights, Landowners, and Mineral Exploration, by Nova Scotia Department of Mines and Energy, February 1986.)

#### **8.4 Granular Resource Inventories**

Granular resource inventories include the following:

**1970's:** Province- wide sand and gravel mapping at 1:50 000 Scale including sampling and sieve testing. Early reports include: Sand and gravel maps & report for Pictou County / Map Scale 1:125 000

**1980's:** Sand and gravel mapping for Cape Breton Island (Cape Breton / Inverness / Victoria / Richmond Counties), Map Scale 1:125 000, plus sample testing (grain size, petrographic, soundness and abrasion tests). An evaluation of tidewater aggregate sources was also undertaken and included grab sampling and testing of bedrock in several strategic shoreline locations with potential for exporting aggregate.

**1990's:** Sand & gravel and bedrock maps & report for Cumberland and Colchester Counties, Map Scale 1:50 000, including sampling and testing (e.g. grain size, petrographic, soundness and abrasion tests). A diamond drilling program in Cumberland County included 20 drill holes to assess bedrock potential near Amherst.

**2000's:** Bedrock aggregate mapping and report for Halifax- Dartmouth region (Halifax County) / Map Scale 1: 100 000

#### **8.5 Public Access and Availability to Data**

##### **Reports/Publications**

Mineral Resources Branch (MRB) maps and publications (Figure 1) are for sale from the DNR Library in Halifax. Many of these maps and publications are also available in HTML, PDF or other digital formats (See Appendix 1) and can be viewed on-line or downloaded FREE through the *NovaScan* database.

Geoscience information on Nova Scotia aggregates is available from two on-line databases containing bibliographic geoscience information (Appendix 2) that can be accessed at Weblink:

[http://www.gov.ns.ca/natr/meb/pubs/pi\\_nvscn.htm](http://www.gov.ns.ca/natr/meb/pubs/pi_nvscn.htm)

**NovaScan** (Figure 2) is the provincial database of geoscience maps and publications for Nova Scotia maintained by the Nova Scotia Department of Natural Resources, Mineral Resources Branch.

The database currently contains over 14,000 records of maps and publications produced by or collected by the Mineral Resources Branch. Information contained in NovaScan includes:

- Geologically indexed records of all the geoscience documents produced or collected by the Mineral Resources Branch (and its predecessors), including:
  - Maps of geology, geochemistry, geophysics, mineral deposits, mineral rights
  - Publications (bulletins, economic geology series, memoirs, papers, reports)
  - Open File releases (illustrations, maps, reports)
  - University theses (B. Sc., M. Sc., Ph. D.)
  - Mineral exploration assessment reports and mining property reports
- NovaScan can be searched by Title, Author / Organization, Subject, Area, Map Sheet (NTS), Map Type, Document Type, Document Number, Year and Scale. See Figure 3.
- NovaScan is updated monthly as new geoscience maps, publications, open files, theses, mineral exploration assessment reports and mining property reports become available
- Note that NovaScan contains only records of maps and publications produced by or collected by the Mineral Resources Branch (and its predecessors). NovaScan **does not** contain any records of Geological Survey of Canada (GSC) maps or publications. GSC records on Nova Scotia can be searched in the [GEOSCAN](#) database

## **8.6 References**

- Drapeau, G. and King, L. H., 1972:  
Surficial geology of the Yarmouth-Browns Bank map area; Marine Sciences, Paper 2; Geological Survey of Canada, Paper 72-24, 6 p.
- Fader, G. B., King, L. H. and MacLean, B., 1977:  
Surficial geology of the eastern Gulf of Maine and Bay of Fundy; Marine Sciences, Paper 19; Geological Survey of Canada, Paper 76-17, 23 p.
- Fowler, J. H., 1981:  
Aggregates resources in Nova Scotia; Canadian Institute of Mining and Metallurgy Bulletin, v. 75, no. 844, p. 100-102.
- Fowler, J. H. and Dickie, G. B., 1977:  
Sand and gravel resources of Pictou County; Nova Scotia Department of Mines, Paper 77-6, 42 p.
- Fowler, J. H. and Dickie, G. B., 1978:  
Sand and gravel occurrence maps; Nova Scotia Department of Mines, Open File Report 378.
- King, L. H. 1970:  
Surficial geology of the Halifax-Sable Island map area; Marine Sciences Branch of Department of Energy, Mines and Resources, Paper 1, 16 p.
- Kranch, K., 1971:  
Surficial geology of Northumberland Strait; Marine Sciences. Paper 5; Geological Survey of Canada, Paper 71-53, 10 p.
- MacLean, B. and King, L. H., 1971:  
Surficial geology of the Banquereau and Misaine Bank map area; Marine Sciences, Paper 3; Geological Survey of Canada, Paper 71-52, 19 p.
- MacLean, B., Fader, G. B. and King, L. H., 1977:  
Surficial geology of Canso Bank and adjacent areas; Marine Sciences, Paper 20; Geological Survey of Canada, Paper 76-15, 11 p.
- Miller, C. K. and Fowler, J. H., 1987:  
Development potential for offshore placer and aggregate resources of Nova Scotia, Canada; Marine Mining, v. 6, p. 121-139.



## Canadian Granular Inventory Programs – Nova Scotia Aggregate Resources Program

Prime, G., 1992:

Aggregate potential of Colchester and Cumberland Counties, Nova Scotia; Nova Scotia Department of Natural Resources, Mines and Energy Branches, Economic Geology Series 92-2.

Prime, G. (Compiler), 2001

Map of Bedrock Aggregate Potential in the Halifax-Dartmouth Metropolitan Area, Nova Scotia; Nova Scotia Department of Natural Resources, Minerals and Energy Branch, Open File Map ME 2001-1, Scale 1:100,000

Wright, W. J., 1985:

Aggregate resources of Cape Breton Island; Nova Scotia Department of Mines and Energy, Maps 85-3 to 85-6.

Figure 1: Nova Scotia Mineral Resources Branch Maps for Sale

# Mineral Resources Branch Maps For Sale

## Table of Contents

### [Bedrock Geology Maps](#)

- [Provincial Scale](#) (1:500 000 or greater)
- [Regional Scale](#) (1:100 000 to less than 1:500 000)
- [Detailed Scale](#) (less than 1:100 000)

### [Glacial/Surfacial Geology Maps](#)

- [Provincial Scale](#) (1:500 000 or greater)
- [Regional Scale](#) (1:100 000 to less than 1:500 000)
- [Detailed Scale](#) (less than 1:100 000)

Figure 2: Nova Scotia Geoscience Publications, Maps and Digital Products



## Geoscience Publications, Maps and Digital Products on Nova Scotia

### Introduction

### Publications Databases

- [NovaScan](#)
- [GEOSCAN](#)

### Maps and Publications for Sale

- [MRB Maps](#)
- [MRB Publications](#)
- [GSC Publications](#)

### Ordering Information and Forms



### Introduction

There is a wealth of geoscience information on Nova Scotia, available as conventional hard copy maps and publications, as digital products, and as on-line searchable, bibliographic geoscience databases.

### Publications Databases

The easiest way to find out what geoscience information exists on Nova Scotia is to search the two on-line databases which contain bibliographic geoscience information on Nova Scotia. These two databases are called *NovaScan* and *GEOSCAN*, and they can both

Figure 3: Nova Scotia - NovaScan Database Search Engine

[Government Home](#) > [Department of Natural Resources](#) > [Mineral Resources Branch](#)

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## NovaScan Database

---

**Search NovaScan**

**Simple Search**  
 (Includes Titles, Authors, Subjects, Areas)

**Advanced Search**

Titles	<input type="text"/>	<input type="button" value="Browse"/>	<input type="button" value="Help"/>
Authors	<input type="text"/>	<input type="button" value="Browse"/>	<input type="button" value="Help"/>
Subjects	<input type="text"/>	<input type="button" value="Browse"/>	<input type="button" value="Help"/>
Areas	<input type="text"/>	<input type="button" value="Browse"/>	<input type="button" value="Help"/>
NTS	<input type="text"/>	<input type="button" value="Browse"/>	<input type="button" value="Help"/>
Map Types	<input type="text"/>	<input type="button" value="Browse"/>	<input type="button" value="Help"/>
Licence Type	<input type="text" value="All"/> <input type="button" value="Help"/>	Licence Number	<input type="text"/> <input type="button" value="Help"/>
Document Type	<input type="text" value="All"/> <input type="button" value="Help"/>	Document Number	<input type="text"/> <input type="button" value="Help"/>
Year:From	<input type="text"/>	Year:To	<input type="text"/> <input type="button" value="Help"/>
Scale:From	<input type="text"/>	Scale:To	<input type="text"/> <input type="button" value="Help"/>
ISN:From	<input type="text"/>	ISN:To	<input type="text"/> <input type="button" value="Help"/>

## **9.0 Prince Edward Island – Granular Resources**

### **9.1 Legislation**

Minerals Exploration Permit is needed to explore for Minerals and a permit can be obtained from the Department of Environment, Energy and Forestry at Weblink:

<http://www.gov.pe.ca/infopei/index.php3?number=20136&lang=E>

This program delivers a system for tracking & regulating the establishing and operating of excavation pits to obtain sand, gravel, stone, shale, etc. A copy of the form can be obtained at Weblink:

<http://www.gov.pe.ca/forms/pdf/47.pdf>

### **9.2 Bedrock Geology**

The geological history of the Island has not lent itself to the development of granular - aggregate resources. The island geology consists of hematite (iron) stained sandstones and conglomerates that are only moderately consolidated and while they may be used as borrow pit (fill) materials, they are generally unsatisfactory for use as a construction aggregate. As a result the majority if not all of the aggregates used in construction in the province are imported to the Island.

### **9.3 Surficial Geology**

The glaciation of the province did not produce any appreciable amount of surficial cover and very little aggregates derived from other sources. Surficial Geology mapping is available in GIS Data format from Department of Environment, Energy and Forestry (Dept. of EEF). A sample surficial geology map (in pdf format) can be viewed at Weblink:

[http://www.gov.pe.ca/photos/original/1973\\_sur\\_geo.pdf](http://www.gov.pe.ca/photos/original/1973_sur_geo.pdf)

The Data Format includes: Shp, Mid/Mif at a unit cost of \$50 payable to the Department of Provincial Treasury. The GIS Price List can be viewed at Weblink:

<http://www.gov.pe.ca/gis/index.php3?number=77867>

The contact information for the Dept. of EEF can be viewed at Weblink:

<http://www.gov.pe.ca/phone/index.php3?number=861>

## **9.4 Aggregate Resources**

The general lack of aggregate resources was confirmed by various word searches of the Provincial Website as follows.

A key word search for the word “granular” at the Provincial Weblink:

<http://www.gov.pe.ca/search/index.php3?currenttab=0&words=Granular>

resulted in 16 hits but only one reference to construction aggregates. This was a reference to the use of “granular” in the construction of Manure Storage facilities, Department of Agriculture.

A key word search for the word “aggregate” at the Provincial Website:

<http://www.gov.pe.ca/search/index.php3?currenttab=0&words=aggregate>

produced 12 hits. Only two were relevant and referred to the “aggregate delivery system” and the importation of aggregate at the Borden-Carleton Fabrication Yard used in the construction of the Confederation Bridge (Strait Crossing).

An excerpt concerning the wharf and fabrication yard is described at Weblink:

<http://www.gov.pe.ca/infopei/index.php3?number=67743&lang=E>

Excerpt from Web Site:

**Water:** The public wharf in Borden-Carleton is owned by the federal Department of Fisheries and Oceans and administered by the local Port Authority. The public wharf offers the following services: salt water, lights, navigation beacon, 110 V and 220 V power, unloading hoist, ramp, and garbage collection.

The nearest container port is in Halifax, Nova Scotia.

The private wharf at the Fabrication Yard was built in 1994 with additions made in 1996. It is a robust dock capable of sustaining heavy loads and is equipped with an excellent system for transporting components. The wharf is well-suited for the fabrication of concrete and steel components and the importation of aggregates.

The wharf consists of a 307 m approach causeway and a concrete crib F-shaped jetty structure. The wharf has tracks for passage of transporter sledges capable of carrying components weighing up to 8,000 tonnes. On the east portion of the wharf, there is a conveyer system for the unloading of aggregate.

The wharf is located in tide water and easily accessible to major shipping routes. This

facility does not require any dredging to maintain and the water line extends to the end of the jetty. There are 4 berthage areas as follows (length by depth):

- 112 m length by 4.9 m depth
- 123 m length by 6.2 m to 7.3 m depth
- 93 m length by 5.5 m depth
- 103 m length by 3.5 m to 5.5 m depth

The ice conditions in the Northumberland Strait at Borden-Carleton allow for ease of movement of non-icebreaking vessels from April to December each year. This is an added convenience of the Borden-Carleton location as the harbour remains open for much of the year.

A key word search for the word “aggregate” at the Provincial Website:

<http://www.gov.pe.ca/search/index.php3?currenttab=0&words=aggregates>

results in four hits, of which only two refer granular “aggregates”, one of which was the Fabrication Yard at Borden-Carleton referenced above and a fourth reference is to the Department of Transportation and Public Works Minerals Laboratory at Weblink:

<http://www.gov.pe.ca/tpwpei/index.php3?number=1001595>

Excerpt follows:

**Transportation and Public Works - Materials Lab** (Last updated October 5, 2004)

This Section provides material quality control and quality assurance services for the Department out of lab facilities located in Mount Stewart and Summerside.

This Section is also responsible for providing technical support in ensuring quality assurance testing for materials incorporated into the transportation infrastructure.

Provide Quality Control/Quality Assurance testing of;

- Soils,
- Aggregates,
- Asphalt cement
- Ashphaltic concrete,
- Portland cement concrete,
- Field supervision of highway construction and highway maintenance projects,
- Inspection of highway construction and highway maintenance projects, both during and after completion.

Provision of expert technical advice to regional engineering staff to aid in the preparation of design, estimates and contract documents.

Pre-construction investigations, sampling and testing for the development of structural design and preparation of contract documents.

Perform deflection testing on selected pavement test sites to monitor pavement strength and advise on the implementation and removal of Spring Weight Restrictions.

Evaluation of highway construction projects by assessing test data and inspection reports for compliance with contract specifications and testing the validity of structural design assumptions.



## **10.0 Newfoundland & Labrador Aggregate Resources**

### **10.1 Aggregates Ownership**

#### **Private Land**

Private lands include the sand, gravel and stone resource only if the original Crown Land Grant included the mineral rights (e.g. Fee Simple Grants) or made specific reference for the inclusion of to sand and gravel in the rights being granted. Otherwise, the property ownership is limited to the immediate ground surface and all rights to the minerals, including aggregates, industrial minerals and building stone are reserved to the Crown. The Act can be found at weblink:

<http://www.hoa.gov.nl.ca/hoa/statutes/m12.htm>

#### **Crown Land**

Granular aggregates on Crown Land are administered by the Newfoundland and Labrador Department of Natural Resources under the [\*Quarry Materials Act, 1998\*](#). Information on the Act, regulations, including application forms, quarry maps and production statistics can be accessed at weblink:

<http://www.nr.gov.nl.ca/mines&en/mqrights/quarryrights.stm>

Industrial minerals are administered by the Department of Natural Resources under the [\*Mineral Act, RSNL 1990 Chapter M-12\*](#) which can be accessed at weblink:

<http://www.hoa.gov.nl.ca/hoa/statutes/m12.htm>

#### **Jointly: Private/Crown**

Operation of pits and quarries (extraction) on lands, where the surface rights are held privately but where the subsurface aggregate or mineral rights are vested in the Crown, are administered under the Quarry Materials Act. Permission of the surface rights owner is required for access to the underlying quarry or mineral materials.

### **10.2 Legislation**

#### **Departmental Responsibility**

Extraction of mineral aggregates is administered by the Director of the Mineral Lands Division, Department of Natural Resources, under the [\*Quarry Materials Act, 1998\*](#).

"Quarry Material" means: a substance used in its natural form for civil construction or agricultural purposes and includes clay, sand, gravel, rock, soil, peat and slag but does not

include slate, marble, granite and similar stone used as dimension stone which is administered under the Mineral Act.

### **Quarry Permit**

A quarry permit may be issued for the extraction of quarry materials on Crown land where the operation will not last more than a year. A subordinate permit may be issued to another user for the same site subject to the approval of the first permit holder. A department of government may apply for a quarry permit.

### **Beach Permit**

The province has an extensive coastline and historically the majority of the settlements are located in coastal areas. Historically, the coastal beaches provided a nearby source of aggregates, however often this resulted in coastal erosion. Commencing in the mid 1970's efforts were made to relocate all commercial extraction to inland locations. This was accomplished by mapping of inland sources of aggregates and publication of this information for the benefit of local contractors.

Local residents may still apply to the Minister for a beach permit to quarry, excavate, remove and dispose of quarry material from a beach provided:

- a) the removal of the quarry material is for non commercial use;
- b) the quarry material to which the beach permit applies is vested in the Crown;
- c) the beach permit is for a period of not greater than 30 days; and
- d) an application is made in the required form and is accompanied by the required fee.

### **Exploration Licence**

An exploration licence under Section 4 (1) of the Act can be obtained for the purpose of sampling, assaying and testing quarry material on Crown Land that is not under current permit or lease.

### **Quarry Leases**

Quarry leases Section 8 (1) of the Act may be obtained for long-term quarrying not exceeding 20 years, subject to the payment of rent based upon area under lease and payment of royalty based upon the quality and quantity of material excavated and removed from the site.

Quarry Permits and Leases are subject to S. 25 (e) of the Regulations which provide for the minister to prescribe: "the restoration and rehabilitation requirements" for areas from which quarry materials are removed and providing for a requirement for a surety to ensure restoration and rehabilitation.

### **10.3 Resource Management (Land Use Planning)**

Information on mineral and aggregate resources is reviewed by the Department of Natural Resources as a component of their input to municipal planning exercises. In addition, applications for Crown Lands are reviewed before the issuance of a Crown Land Grant. Aggregate resource inventories and geological mapping are available to assist municipal land use planning and to ensure adequate aggregate resources are available for future use.

### **10.4 Granular Resource Inventories**

The process of compiling Aggregate Inventories can be divided into three parts; Office work such as Air photo interpretation, Field Work, such as Surficial Mapping, Test Pits, and Sampling and Laboratory Work such as Grain Size or Petrographic Analyses.

#### **1. Office:** Interpretation (Airphoto) for topology

Airphoto Interpretation specific to the identification of potential areas to explore for aggregates

#### **2. Field Work:** Surficial Mapping (Ground Truthing)

Surficial geology and Aggregate mapping is available the majority of the Island (Figure 1). This mapping provides data on the aerial distribution of various types of material and landforms found at the surface. Surficial Geology maps are largely derived from the interpretation of aerial photography and are supplemented with a variable amount of field checking.

Some of the mapping includes a “reliability diagram” which provides a measure of the amount of field checking. Each map has a detailed legend attached that describes the characteristic of each sediment type and features encountered including a genetic category that defines the sediment type (e.g., glacial, fluvial, aeolian), and a morphological modifier (category) that describes the surface expression of the deposit (e.g., veneer, blanket, hummocky, fan). Selection of a particular map sheet on the on-line interactive map (Figure 1) provides a summary of the surficial and aggregate inventory work for that map area.

#### **3. Aggregate Geology Maps**

Aggregate mapping is available for most of the traveled portions of the Province including the Island (Figure 2) and Labrador (Figure 3). These index maps provide the name of the author, year of report and map number for each field area (Figures 4 and 5). Information in these reports includes mapping to outline sand and gravel deposits and categorization of each deposit by their potential as an aggregate producing area (e.g. with Zone 1 having the highest potential). Recent maps commonly include grain size and petrographic data. Potential reserves of material are approximated based on the aerial extent and estimated depth of deposits based upon natural or man-made exposures. Detailed descriptions are commonly provided in associated Current Research articles.

Bedrock aggregate mapping based upon bedrock geological mapping (Figure 6) define rock types suitable for construction aggregate uses, including class A and B material, rip-rap, asphalt and concrete. The suitability of individual rock types is defined on the basis of physical characteristics (e.g., hardness, grain size, fractures, and mineral constituents), petrographical properties (e.g., petrographic number) and chemical/mechanical properties (e.g., abrasion, soundness, alkali reactivity). Some aggregate maps include this data. Data for other areas may be found in associated Current Research articles or may be obtained from the Terrain Sciences Section, Geological Survey Branch, Telephone (709) 729-5634.

#### **4. Laboratory (Analytical) Programs:**

- a) Grain Size Analysis (Sieving - Metric (Wentworth)
  - Field sieve analyses 4mm to 32mm retained fractions
  - Laboratory analyses on 4mm to 0.064mm (4phi) fraction.
- b) Petrographic Analysis (Rock Quality of Aggregates) of the pebble (16-32mm) fraction collected in the field.
- c) Alkali Reactivity Testing: Not conducted on a routine basis, however tests have been conducted on samples from some site specific locations such as potential sources of concrete aggregate proposed for construction of the Hibernia concrete drilling platform.

#### **10.5 Public Access and Availability to Data / Internet Availability**

The Department of Natural Resources has available their “Online Access to Maps and Reports of the Geoscience Resources of Newfoundland and Labrador” through a series of “Index” maps (Figure 5). In this section of the website, a search for reports in the Geofiles (Figure 7) can be carried. This allows the user to search for documents based on criteria such as NTS Sheet, Geographic Area, Company, Author, Keyword and Nomenclature. These documents can then be purchased by phone or in some cases viewed online and/or downloaded.

There is also an interactive map called the Newfoundland and Labrador Mineral Resource Atlas (Figure 8) that is accessible through the Newfoundland Geological Survey website at

<http://gis.geosurv.gov.nf.ca/>

Analytical data of field samples can be obtained on-line through the Mineral Occurrence Database System (MODS) (Figure 9), including grain size and petrographic analyses. Information can also be from the Terrain Sciences Section, Geological Survey Branch.

#### **10.6 Reports/Publications**

Both bedrock and surficial geology mapping and documentation are available through the Newfoundland and Labrador Department of Natural Resources Geological Survey website (Figure 10).

Quarry maps are available for reviewing on [The Newfoundland and Labrador Geoscience Resources Atlas](#) (Figure 7) and are also on file with the Mineral Lands Division (3rd floor, Natural Resources Building, 50 Elizabeth Avenue, St. John's).

A PDF of an Index to Current Surficial Mapping, Newfoundland and Labrador can be found at weblink:

<http://www.nr.gov.nl.ca/mines&en/geosurvey/maps/surficialindex.pdf> .

Both Bedrock and Surficial and Aggregate Geology maps for Newfoundland and Labrador are currently available through the Newfoundland website by searching two index maps available online. The maps are listed by NTS map sheet, and are mostly at scales of 1:50,000 or 1:250,000. Maps are available as blue line, printed black line or colour maps, and digital on demand colour maps. For ease of searching, information is listed by 1:250,000 scale NTS map sheet, and is divided into 4 separate categories under the headings of Ice Flow, Surficial Geology and Aggregate Geology. A section of pertinent Current

### **Aggregate Geology Maps**

These maps provide data on granular or bedrock aggregates within an area. Granular aggregate maps outline sand and gravel deposits, and categorize each deposit by their potential as an aggregate producing area, with Zone 1 having the highest potential. Recent maps commonly include grain size and petrographic data. Sample data, including grain size and petrographic analyses, related to other map areas can be obtained from the Terrain Sciences Section, Geological Survey Branch, Telephone (709) 729-3888.

Potential reserves of material are approximated based on the aerial extent and depth of natural or man-made exposures. Detailed descriptions are commonly provided in associated Current Research articles.

Bedrock aggregate maps define rock types suitable for construction aggregate uses, including class A and B material, rip-rap, asphalt and concrete. The suitability of individual rock types is defined on the basis of physical characteristics (e.g., hardness, grain size, fractures, mineral constituents), petrographical properties (e.g., petrographic number) and chemical/mechanical properties (e.g., abrasion, soundness, alkali reactivity). Some maps include this data. Data for other areas may be found in associated Current Research articles or may be obtained from the Terrain Sciences Section, Geological Survey Branch.

## **10.7 References**

1. Title: Granular Aggregate Mapping in Southeast Labrador

Current Research Report #05-1

Author: Ricketts, M.J.

Product No.:

Ministry Reference:

Category: Miscellaneous/Newfoundland Geological Survey

Format: Soft Copy Pg. 27-37

Additional Information: Geochemistry, Geophysics and Terrain Sciences Section

2. Title: Index to Current Surficial Mapping, Newfoundland and Labrador

Open File # Nfld/2677 Version 3

Author: Compiled by Taylor, D., Liveman, D.

Product No.:

Ministry Reference:

Category: Miscellaneous/Newfoundland Geological Survey

Format: Digital

Additional Information: This map replaces Map 2001- 37

3. Title: Regional Ice-Flow Mapping, Surficial Geology and Till Geochemistry of the Northern Burin Peninsula and adjacent Placentia Bay

Author: M. Batterson, D. Taylor, T. Bell, D. Brushett and J. Shaw

Product No.:

Ministry Reference: Report 06-1

Category: Miscellaneous/Newfoundland and Labrador Geological Survey

Format: Digital

Additional Information:

4. Title: Surficial geology of the Grand Bank map sheet [NTS 1M/04]

Author(s): Vanderveer, D G, Ricketts, R J and Kirby, F T

Year: 2005

Source: Government of Newfoundland and Labrador, Department of Natural Resources, Geological Survey, Open File 1M/04/0528, [Map 2005-13], 2005.

NTS: 1M/04

5. Title: Surficial geology of the St Lawrence map sheet (NTS 1L/14)

Author(s): Kirby, F T, Ricketts, R J and Vanderveer, D G

Year: 2006

Source: Government of Newfoundland and Labrador, Department of Natural Resources, Geological Survey, Open File 1L/14/0183, [Map 2005-11], 2006.

NTS: 1L/14

6. Title: Assessment report on industrial mineral quality for 2005 submission for quarry materials exploration licence in the Stock Cove area, Bull Arm, on the Avalon Peninsula, Newfoundland

Author(s): Mercer, R

Year: 2006

Company(s): Terra Nova Industries Limited

Source: Newfoundland and Labrador Geological Survey, Assessment File 1N/13/0785, 2006, 14 pages.

NTS: 1N/13

7. Title: Granular-aggregate resources of the Weirs Pond map sheet [NTS 2E/01]

Author(s): Ricketts, M J

Year: 2007

Source: Government of Newfoundland and Labrador, Department of Natural Resources, Geological Survey, Open File 2E/01/1491, [Map 2007-19], 2007.

NTS: 2E/01

8. Title: Glacial spillway deposits in the Gander Lake-Gambo area

Author(s): McCuaig, S

Year: 2006

Source: Edited by C. P. G. Pereira and D. G. Walsh, Government of Newfoundland and Labrador, Department of Natural Resources, Geological Survey, Report 6-1, 2006, pages 209-219.

9. Title: Regional ice-flow mapping, surficial geology and till geochemistry of the northern Burin Peninsula and adjacent Placentia Bay

Author(s): Batterson, M, Taylor, D, Bell, T, Brushett, D and Shaw, J

Year: 2006

Source: Edited by C. P. G. Pereira and D. G. Walsh, Government of Newfoundland and Labrador, Department of Natural Resources, Geological Survey, Report 6-1, 2006, pages 161-176.

10. Title: Assessment report on geological exploration for 2005 submission for quarry materials exploration licence in the Southwest River area, eastern Newfoundland

Author(s): Mercer, R

Year: 2005

Company(s): Mac-Court Holdings Limited

Source: Newfoundland and Labrador Geological Survey, Assessment File 2D/0628, 2005, 10 pages.

NTS: 2D/01, 2D/08



**Figure 1: Newfoundland Index to Surficial Geology and Aggregate Maps**



**Geological Survey  
of Newfoundland and Labrador**

#### 110/14

Surficial and glacial geology and gravel resource inventory of southwestern Newfoundland. By D.G. Vanderveer, 1977. 10-page report and 10 maps, including Stephenville-Port aux Basques (12B-110), Main Gut (12B/8), Flat Bay (12B/7), Little Friars Cove (12B/3), St. Fintans (12B/2), Rose Blanche (110/10), Port aux Basques (110/11), and Codroy (110/14). NFLD/0959

#### Aggregate Geology

Inventory of aggregate resources in Newfoundland and Labrador, by F.T. Kirby, R.J. Ricketts and D.G. Vanderveer. Scale 1:250,000. Nfld. 1287 and Lab. 602. Plus Report 83-2. Map 83-03 Port aux Basques, 110.

MAP 01-07 2001: Granular aggregate resource of the Codroy map sheet (NTS 110/14), by M.J. Ricketts. Scale: 1:50 000. Newfoundland Department of Mines and Energy, Geological Survey. Open File 0110/14/0352.

#### CONTACTS

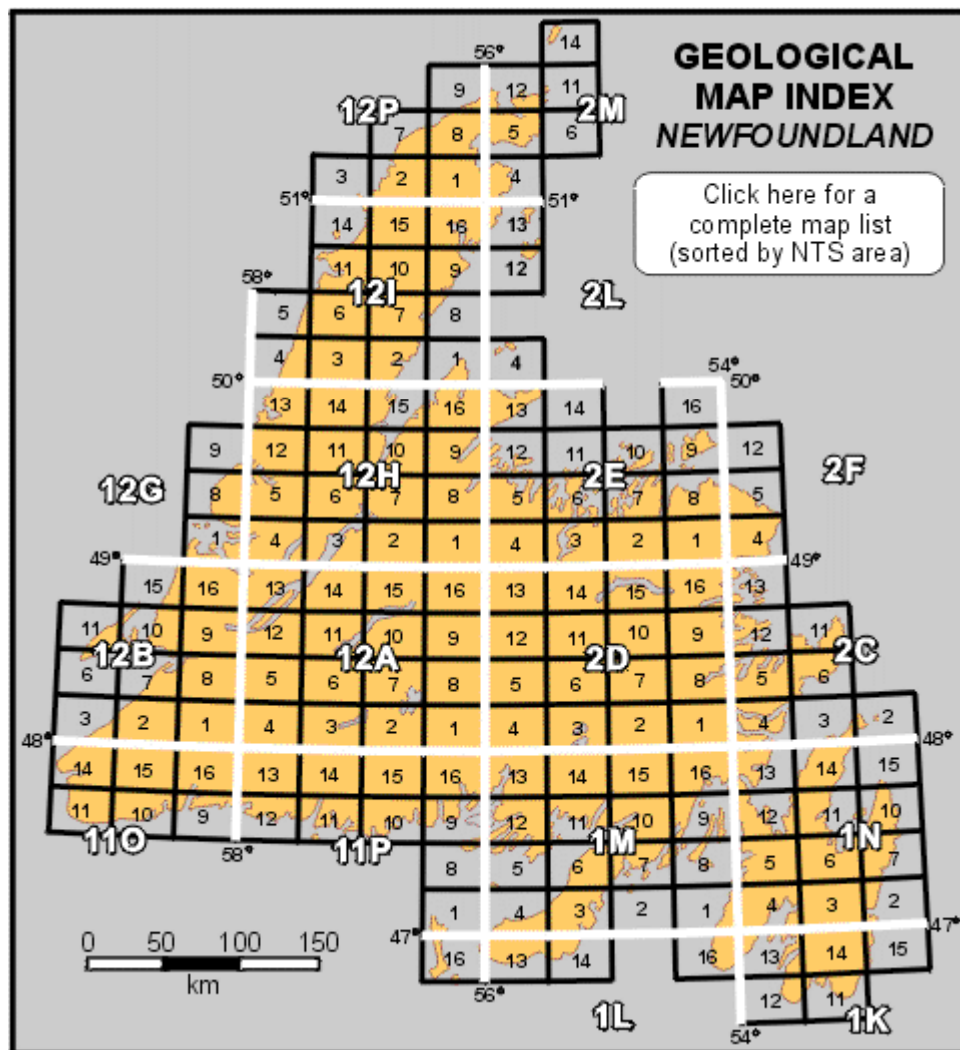
##### For publications and general information:

Norman Mercer

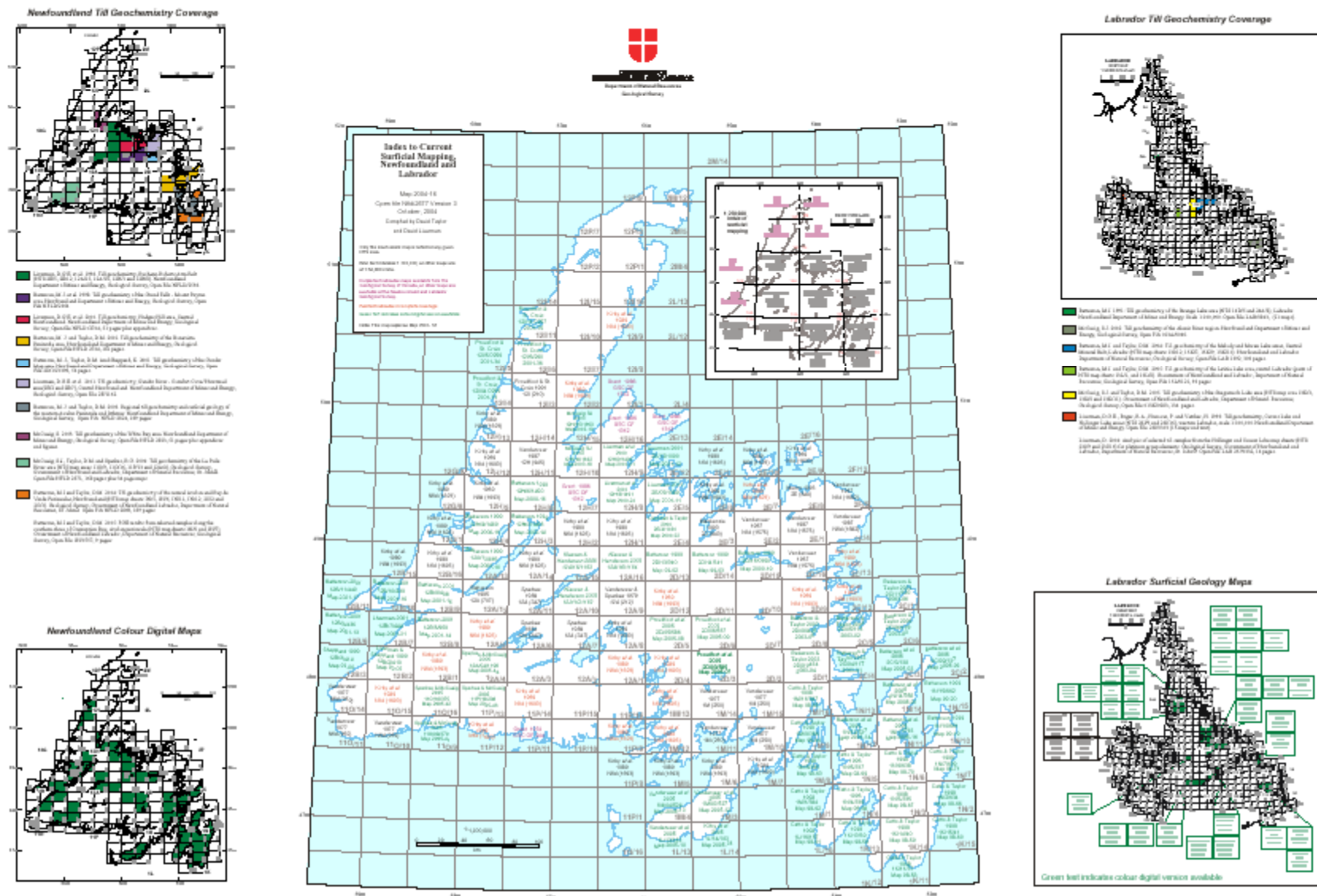
Geological Survey of Newfoundland and Labrador  
(709) 729-6193

[nlm@zeppo.geosurv.gov.nf.ca](mailto:nlm@zeppo.geosurv.gov.nf.ca)

#### *Index of Surficial Geology and Aggregate maps for Newfoundland*

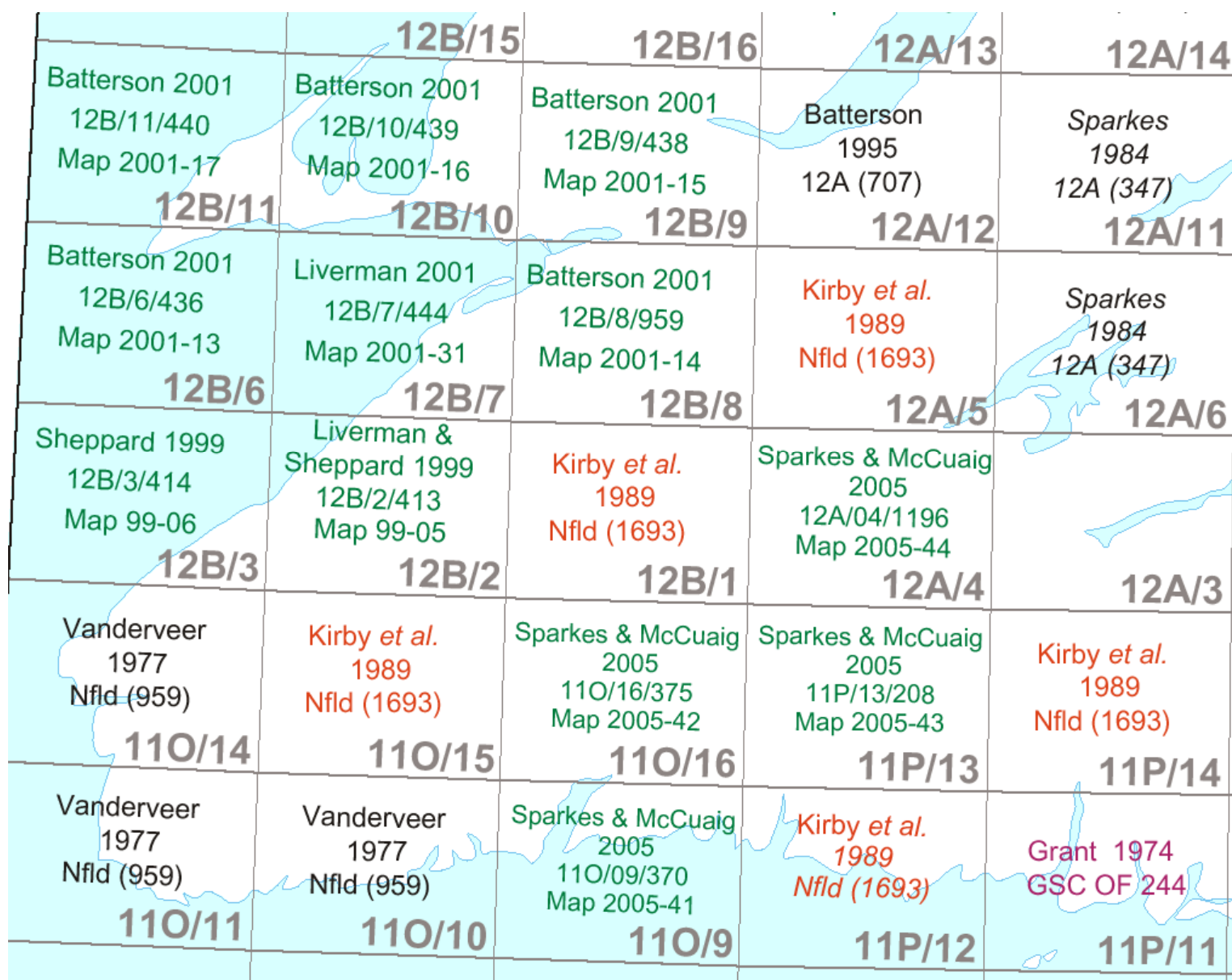


### Figure 2: Newfoundland Index to Current Surficial and Aggregate Mapping

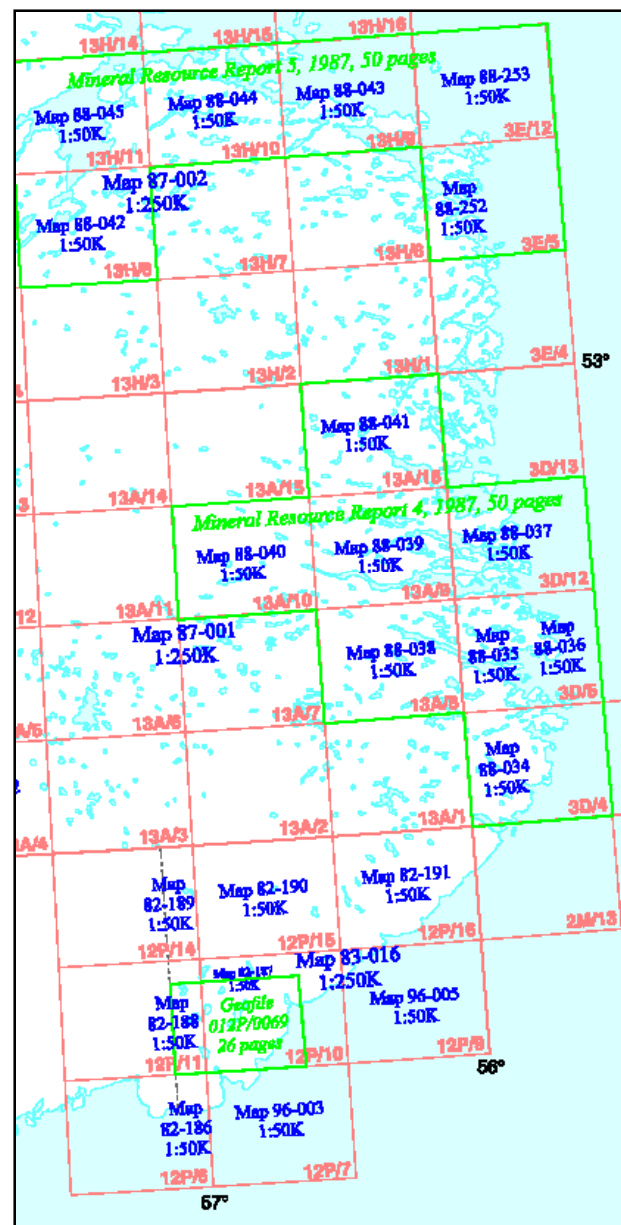


[illegible]

**Figure 4: Enlargement of Index to Surficial and Aggregate Mapping for SW Nfld.**



**Figure 5: Enlargement of Index to Aggregate Mapping for Southeast Labrador**



**Figure 6: Newfoundland Index to Bedrock Geology Maps**



**Geological Survey**  
of Newfoundland and Labrador

**12B/07**

Fong, C.C.K.

1977: Flat Bay-Main Gut. Map 77-004. Scale: 1:50 000. Government of Newfoundland and Labrador, Department of Mines and Energy, Mineral Development Division, Open File 012B/0210. Blueline paper. GS#012B/0210

Knight, I.

1983: Geology of the Carboniferous Bay St. George Subbasin. Map 82-001. Scale: 1:125 000. In Geology of the Carboniferous Bay St. George Subbasin, Western Newfoundland. Government of Newfoundland and Labrador, Department of Mines and Energy, Mineral Development Division, Memoir 1, 382 pages, (2 fold-outs); enclosures (map, table, 4 figures, 6 fold-outs). GS# NFLD/1314 [Preview Map](#)

**CONTACTS**

**For publications and general information:**

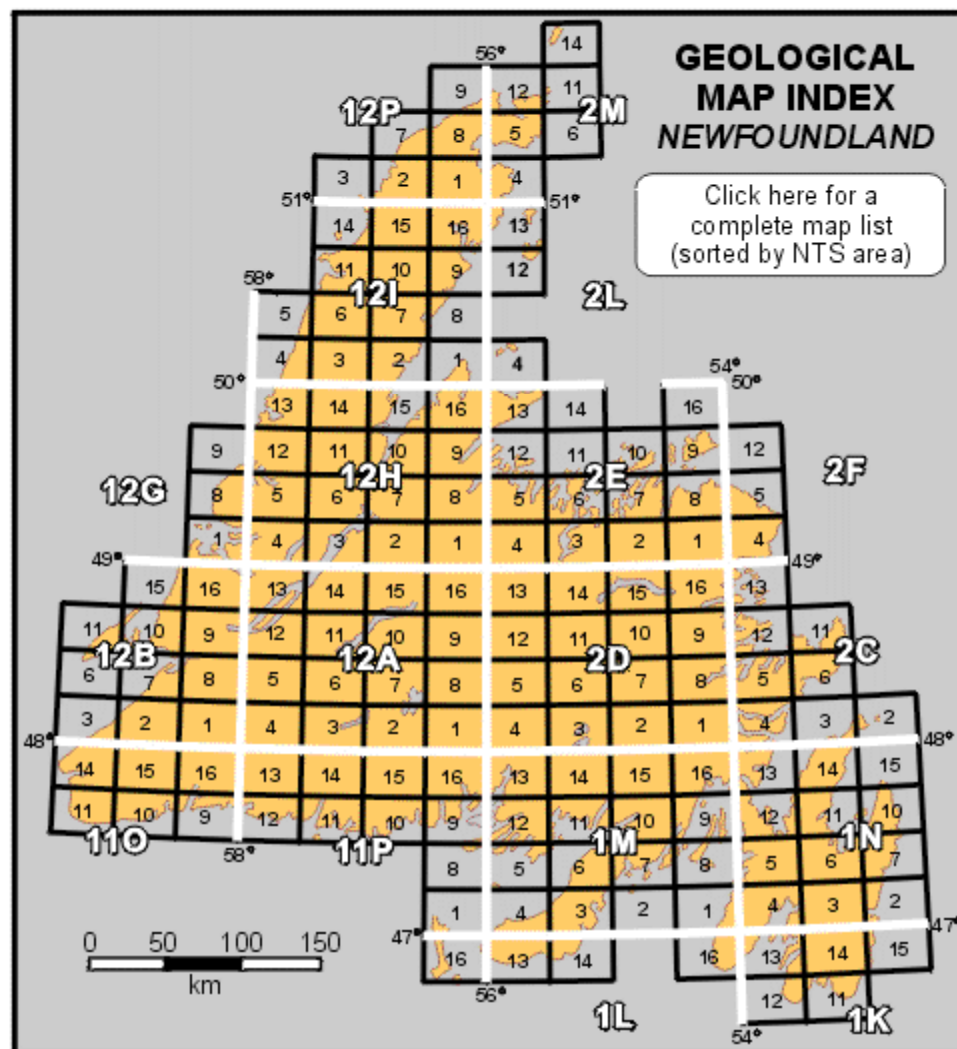
Norman Mercer

Geological Survey of Newfoundland and Labrador  
(709) 729-6193

[nlm@zeppo.geosurv.gov.nf.ca](mailto:nlm@zeppo.geosurv.gov.nf.ca)

[Labrador Map](#)

**Bedrock Geology Maps For Newfoundland**



**Figure 7: Newfoundland and Labrador Geofiles Database**

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Title

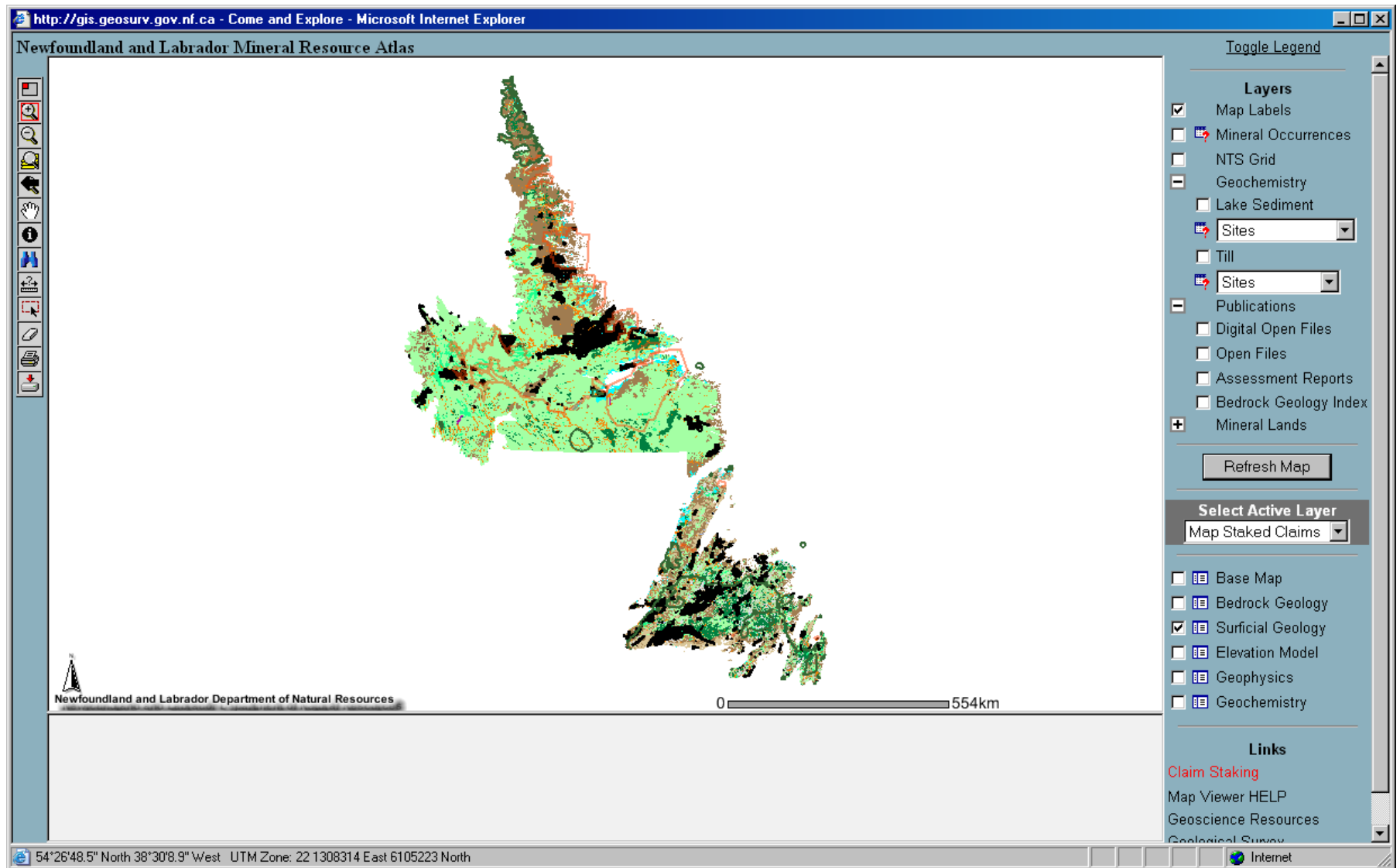
Geofile Number

Licence Number

Document Number



**Figure 8: Newfoundland and Labrador Mineral Resource Atlas**





**Figure 9: Newfoundland and Labrador Mineral Occurrence Data System (MODS)**

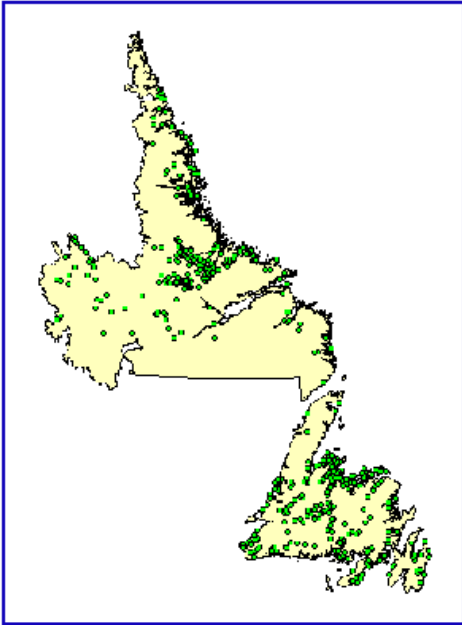
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**Mineral Occurrence Data System (MODS)**



Mineral Deposit (MODS) Index Search Form

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**Figure 10: Newfoundland and Labrador Geological Survey**

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