REGIONAL STREAM SEDIMENT AND WATER GEOCHEMICAL DATA

TERRACE & PRINCE RUPERT (NTS 103I & 103J), BRITISH COLUMBIA

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INTRODUCTION

The reanalysis of archived stream sediment samples by inductively coupled plasma mass spectrometry (ICP-MS) is accepted as a cost-effective means of obtaining new and improved regional geochemical information. This technique provides a significant upgrade from the atomic absorption spectroscopy (AAS) method routinely used for federal and provincial government-funded reconnaissance-scale drainage sediment surveys conducted before 1999. The use of ICP-MS not only provides a wide range of new analytical information at improved detection levels but also offers greater data compatibility with laboratory methods currently being employed.

Recognizing the advantages associated with this type of initiative, Geoscience BC in partnership with the Terrace Economic Development Authority (TEDA), the Regional District of Kitimat-Stikine through the Northern Development Initiative Trust (NDIT) and the KT Industrial Development Society (KTIDS) provided funding for the recovery and analyses of stream sediment pulps from a 1978 geochemical survey conducted in the Terrace and Prince Rupert areas (NTS map sheets 103I and 103J; Figure 1).

Geoscience BC Report 2008-11 includes results from the original 1978 survey, instrumental neutron activation analysis (INAA) data released in 1995, and the new ICP-MS data. The information has been provided in a variety of digital formats. PDF files include survey descriptions and details regarding methods, field and analytical data listings, summary statistics, sample location map, geology map and maps for individual metals. Raw digital data files used in the production process are included in XLS and DBF formats.

The resulting geochemical data compilation will provide the mining and exploration community with over 90 elements in stream sediments for each of the 2128 sample sites at an average density of one site every 8 km^2. In addition, the work will complement other geoscience research and data mining activities as well as ongoing

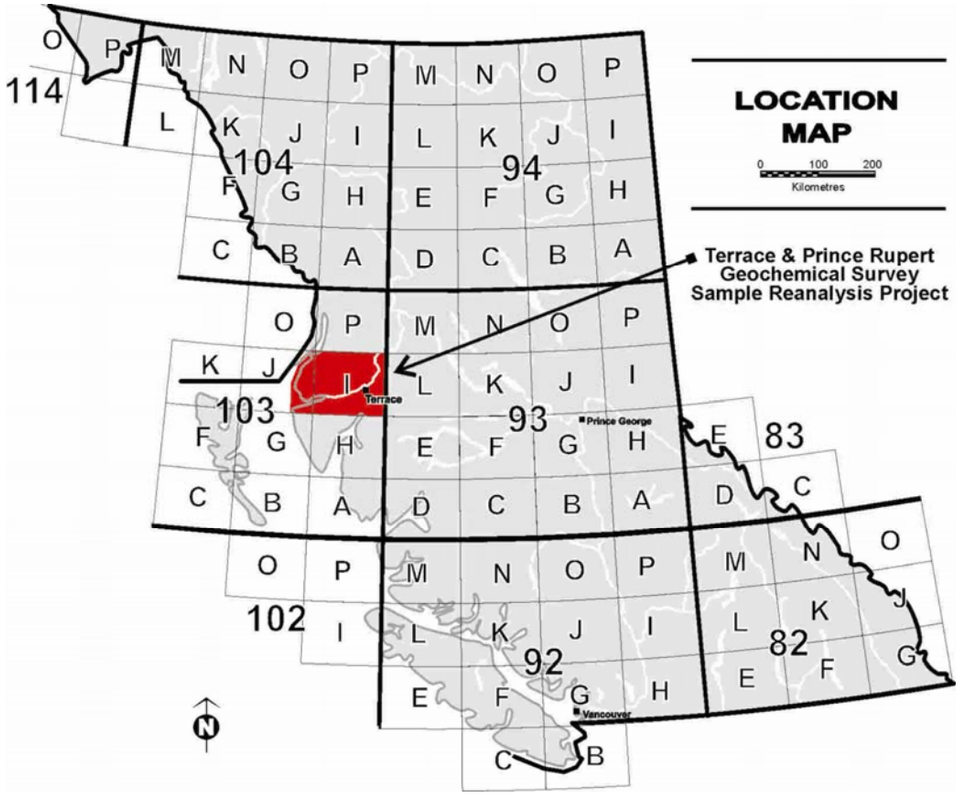

Figure 1. Location of survey area in Western British Columbia.

efforts to develop a comprehensive collection of geochemical information for the province. Currently, the provincial database includes analytical information for approximately 65 000 sample sites and covers over 70% of BC[1].

[1]Lett, R.E.W. (2005): Regional geochemical survey database on CD; BC Ministry of Energy, Mines and Petroleum Resources, Geofile 2005-17, CD-ROM.

TERRACE & PRINCE RUPERT SURVEY HISTORY

Conducted in 1978 by the British Columbia Geological Survey (BCGS), the Terrace and Prince Rupert survey was funded by the Accelerated Mineral Development Program as part of the Federal government's Uranium Reconnaissance Program (URP). The joint Federal-Provincial survey included the collection of stream sediment and water samples from 2128 sites covering an area of 17 500 km^2. The results of the program were released in 1979 and included analytical data for 13 metals in the stream sediment samples plus pH, uranium and fluoride in stream waters[2]. By design, portions of sediment samples from these government-funded regional geochemical surveys were saved on the understanding that advances in laboratory methods would provide opportunities to further develop the federal and provincial geochemical databases.

In the early 1990s, as part of the BC Regional Geochemical Survey (RGS) program and in co-operation with the Geological Survey of Canada (GSC), over 24 000 archived sample pulps were reanalyzed by instrumental neutron activation analysis (INAA) for gold and a range of pathfinder metals and rare earth elements[3]. This province-wide initiative provided access to important new analytical information at improved detection levels and has significantly enhanced the utility of the provincial geochemical database. INAA results for the Terrace and Prince Rupert samples were released in 1995[4].

More recently, saved sample pulps are being systematically reanalyzed by ICP-MS. This modern analytical technique provides a wide range of new analytical information at improved detection levels and also offers greater data compatibility with laboratory methods currently being employed[5]. During 2008, as part of the Terrace and Prince Rupert reanalysis project, a total of 2133 sediment pulps and associated quality control samples were analyzed by ICP-MS.

REANALYSIS PROJECT METHODOLOGY

Drainage sediment pulps from previous government survey programs are currently stored at facilities in Ottawa and Victoria. The collections are maintained by Natural Resources Canada (NRCan) and the BCGS, respectively. Samples are stored in plastic containers organized by NTS map sheet designation and in order of sample identification numbers. Opportunely, the archive also includes original analytical duplicate and control reference samples that can be used to monitor and assess the accuracy and precision of any subsequent analytical work. On average, up to 30 grams of the –80 mesh (180 µm) sediment fraction is available but in some cases samples may be missing or there is insufficient material remaining in the storage vials.

Geoscience BC, with support from NRCan and the BCGS, was provided access to the Terrace and Prince Rupert samples stored in Ottawa. A 1 to 2 gram portion of archived stream sediment sample was carefully extracted from storage containers. Material from each vial was independently split and transferred to a Ziploc® bag labeled with the sample's original unique identification number. Once secured for shipping, the recovered material was delivered to Acme Analytical Laboratories Ltd. (Vancouver). At the lab each sample was analyzed for 53 elements by ICP-MS analysis using an aqua regia digestion. A complete list of the elements and associated detection limits are provided in Table 1. Data for boron and tantalum were not published because of inadequate detection limits and/or precision.

The resulting data was carefully checked for analytical quality using inserted blind duplicate and control reference samples. When the information was determined to be complete and accurate, the data was digitally merged with original sample site location information, AAS and INAA analytical results and field observations.

[2] Ballantyne, S.B., Hornbrook, E.H.W. and Johnson, W.M. (1981): National geochemical reconnaissance, Prince Rupert-Terrace, British Columbia (NTS 103I and part of 103J); Geological Survey of Canada, Open File 772, 93 p.

[3] Jackaman, W., Matysek, P.F. and Cook, S.J. (1991): The regional geochemical survey program: summary of activities; *in* Geological Fieldwork 1991, BC Ministry of Energy, Mines and Petroleum Resources, Paper 1992-2, p. 307–318.

[4] BC Ministry of Energy, Mines and Petroleum Resources (1995): Regional Geochemical Survey, Terrace and Prince Rupert (NTS 103I, J); BC Ministry of Energy, Mines and Petroleum Resources, BC RGS 42, URL <http://www.em.gov.bc.ca/Mining/Geolsurv/Geochinv/rgs/sheets/103ij.htm> [November 2008].

[5] Jackaman, W., Balfour, J.S. and Reichheld, S.A. (2009): QUEST-West Project geochemistry: field survey and data reanalysis (parts of NTS 093E, F, J, K, L, M, N), central British Columbia; *in* Geoscience BC Summary of Activities 2008, Geoscience BC, Report 2009-1.

Table 1. List of elements and associated detection limits from ICP-MS analysis.

Element	Detection Limit	Units	Element	Detection Limit	Units	Element	Detection Limit	Units
Aluminum	0.01	%	Indium	0.02	ppm	Scandium	0.1	ppm
Antimony	0.02	ppm	Iron	0.01	%	Selenium	0.1	ppm
Arsenic	0.1	ppm	Lanthanum	0.5	ppm	Silver	2	ppb
Barium	0.5	ppm	Lead	0.01	ppm	Sodium	0.001	%
Beryllium	0.1	ppm	Lithium	0.1	ppm	Strontium	0.5	ppm
Bismuth	0.02	ppm	Magnesium	0.01	%	Sulphur	0.02	%
Cadmium	0.01	ppm	Manganese	1	ppm	Tellurium	0.02	ppm
Calcium	0.01	%	Mercury	5	ppb	Thallium	0.02	ppm
Cerium	0.1	ppm	Molybdenum	0.01	ppm	Thorium	0.1	ppm
Cesium	0.02	ppm	Nickel	0.1	ppm	Tin	0.1	ppm
Chromium	0.5	ppm	Niobium	0.02	ppm	Titanium	0.001	%
Cobalt	0.1	ppm	Palladium	10	ppb	Tungsten	0.1	ppm
Copper	0.01	ppm	Phosphorus	0.001	%	Uranium	0.1	ppm
Gallium	0.1	ppm	Platinum	2	ppb	Vanadium	2	ppm
Germanium	0.1	ppm	Potassium	0.01	%	Yttrium	0.01	ppm
Gold	0.2	ppb	Rhenium	1	ppb	Zinc	0.1	ppm
Hafnium	0.02	ppm	Rubidium	0.1	ppm	Zirconium	0.1	ppm

DATA PRESENTATION

Geochemical information compiled in this report includes field and analytical results from samples collected during a regional stream survey conducted in 1978 (N = 2253), INAA data and ICP-MS data. The data package has been prepared as a PDF document and presents survey results in three appendices that are described as follows:

Appendix 'A': Is a complete listing of original site location information, field observations and analytical data from the 1978 survey, INAA data released in 1995, and new ICP-MS results. Tables have been provided that define codes used for field observations and underlying geology.

Appendix 'B': Presents summary statistics for individual elements and a more detailed summary based on the underlying bedrock geology determined at each sample site. The calculations have been determined from raw data. AAS and ICP-MS values reported by the labs at less then detection limit have been set to half the detection limit. Previously published INAA data values reported below detection limit were set to the detection limit.

Appendix 'C': Includes a sample location map, simplified geology and mineral occurrence map and proportional symbol maps for each element. For most maps the symbol size and colour reflects data ranges that are based on percentile ranges as determined from the raw data. Maximum symbol size is assigned to highest values. Portraying high values with large, bold symbols, with background values represented by relatively smaller dots, helps highlight regional trends and anomalous sample sites.

The data summary presented in this package is not considered exhaustive. In order to accommodate more detailed assessments, raw digital data files have been included in XLS and DBF formats.

ACKNOWLEDGMENTS

Geoscience BC[6] in partnership with the Terrace Economic Development Authority (TEDA), the Regional District of Kitimat-Stikine through the Northern Development Initiative Trust (NDIT) and the KT Industrial Development Society (KTIDS) provided funding for the 2008 Terrace and Prince Rupert ICP-MS reanalysis project. L. McKeown (Progressive Ventures Ltd., Terrace) contributed to the development of the project. P. Friske and M. McCurdy of NRCan and D. Lefebure and R. Lett of the BCGS provided project support.

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