Compendium of Research in the Northwest Territories

2007

This publication is a collaboration between the Aurora Research Institute, the Canadian Department of Fisheries and Oceans, the Department of Environment and Natural Resources, the Government of the Northwest Territories and the Prince of Wales Northern Heritage Centre. Thank you to all who submitted a summary of their research, photographs and helped make this publication possible.

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Northwest Territories Environment and Natural Resources

Northwest Territories Education, Culture and Employment

Foreword

This annual publication of the Compendium of Research in the Northwest Territories marks a special time in research in the North. The International Polar Year (IPY) programme started March of this year and will continue into the next two years. This initiative was organized though the International Council for Science and the World Meteorological Organization, and implemented here in Canada through the Canadian International Polar Year Office in Ottawa.

IPY has focused the research world on the North. It has attracted world leaders in their respective fields to come research a wide range of physical, biological and social research topics. These projects have focused research on advancing our understanding of cultural, social, economic and health issues of the polar region with the ultimate goal of addressing the impacts of climate change and the health and well-being of northern communities. IPY has also focused funding on building technical capacity and creating educational and research opportunities for Northerners. This allows us to better understand and share our unique knowledge of our territory. Researchers that have worked this year under IPY funding have been acknowledged in the Compendium by a small IPY logo beside their name.

This Compendium shows the sheer volume of research that is taking place in the Territories. It represents a comprehensive compilation of licenced research from the Aurora Research Institute, the Department of Environment and Natural Resources (ENR), the Department of Fisheries and Oceans (DFO) and the Prince of Wales Northern Heritage Centre. This publication is meant to be a starting point for pursuing information on research in the NWT. I encourage you to contact the researchers listed here within to find out more information and in-depth results.

As we move into the second year of the IPY programme, I look forward to seeing the focus on the North grow and the NWT continuing as a place of innovative and exciting discovery.

Andrew Applejohn
Director, Aurora Research Institute

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Introduction

The Compendium of Research in the Northwest Territories is a summary of research licences/permits that were issued in the Northwest Territories during 2007. The information contained in this book is a collaboration between the Aurora Research Institute (ARI), the Prince of Wales Northern Heritage Centre (PWNHC), the Department of Environment and Natural Resources (ENR) and the Department of Fisheries and Oceans (DFO). The Compendium series began in 1986.

Licensing in the NWT

Under territorial legislation, all research in the NWT requires a licence/permit from one of four agencies, depending on the type of research being conducted:

- Prince of Wales Northern Heritage Centre - Archaeology
- Department of Environment and Natural Resources, Government of the Northwest Territories – Wildlife
- Department of Fisheries and Oceans - Fisheries
- Aurora Research Institute - All other research in the NWT

Through the licencing process, researchers are informed of appropriate organizations, communities and other licencing/permitting agencies that should be contacted prior to conducting studies. Licensing ensures research activities are communicated to interested parties and provides opportunities for the exchange of information.

The Compendium is a summary of all licences/permits issued in the NWT by all four licencing/permitting bodies. These remain only summaries and the reader is encouraged to contact the researcher for further verification and additional information.

How to Use This Book

This book has four main sections. Each of these sections reflects a specific licensing agency and type of licence/permit issued. Within each section research descriptions have been grouped by subject, and listed alphanumerically by the principal researcher's last name. Refer to the Table of Contents for the specific page on which each section and/or subject begins. An index is included at the end listing all researchers in each section.

1. File Number

The file numbers shown in each of the Aurora Research Institute's subject areas refer to the file number issued to a particular researcher. It allows cross referencing with research material that may be available on file or in the ARI library. The reference numbers of the other three agencies refers directly to the permit numbers given to each researcher. When requesting information from any of these agencies on specific research outlined in the Compendium, please refer to the reference number in your

correspondence.

2. Regional Abbreviations

Throughout the book reference is given to the specific land claim region(s) in which the research took place. The regions are shown in Figure 1. Some of the land claim regions are still under negotiation and boundaries shown are only approximations. The abbreviations shown for each region are as follows:

DC	Deh Cho	**SS**	South Slave
NS	North Slave	**SA**	Sahtu Settlement Area
IN	Inuvialuit Settlement Region	**GW**	Gwich'in Settlement Area

3. Glossary

A glossary of terms has been added to the Compendium. The intent of the glossary is to allow the reader to better appreciate the research descriptions.

4. International Polar Year

Projects that have received International Polar Year funding in 2007 will be noted by the following symbol: 2007-2008 API·IPY

Available in Print or Free Download

The Compendium is available as a printed publication. The Compendium can be downloaded from the Aurora Research Institute's website (www.nwtresearch.com) or a copy can be requested by contacting the Aurora Research Institute. We encourage photocopying of the printed publication to promote its distribution.

Send Us Your Comments

Whether you are a researcher or an interested member of the public, the Aurora Research Institute welcomes your comments and suggestions about the Compendium. Contact us by mail, fax, email or telephone (see address below).

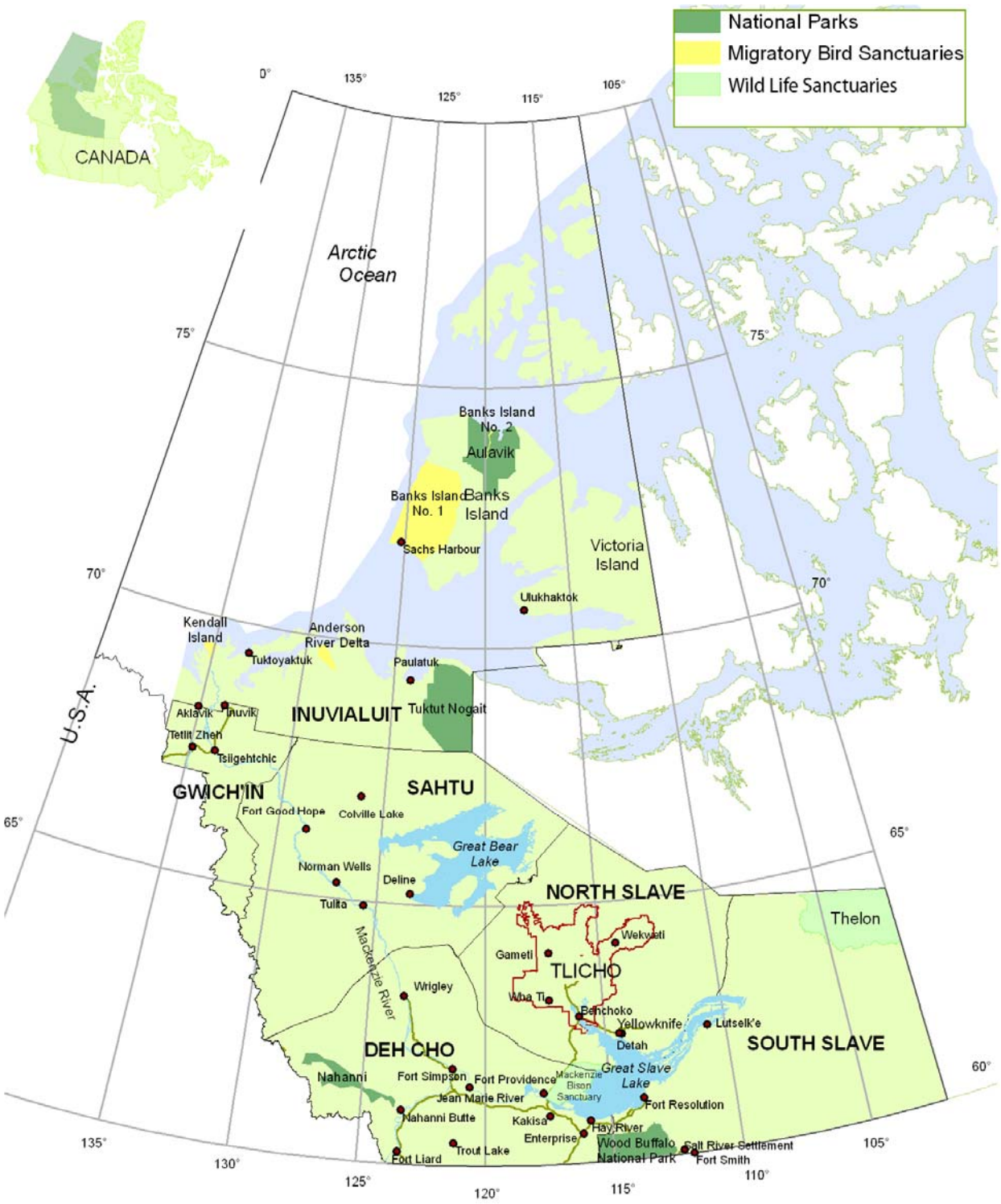
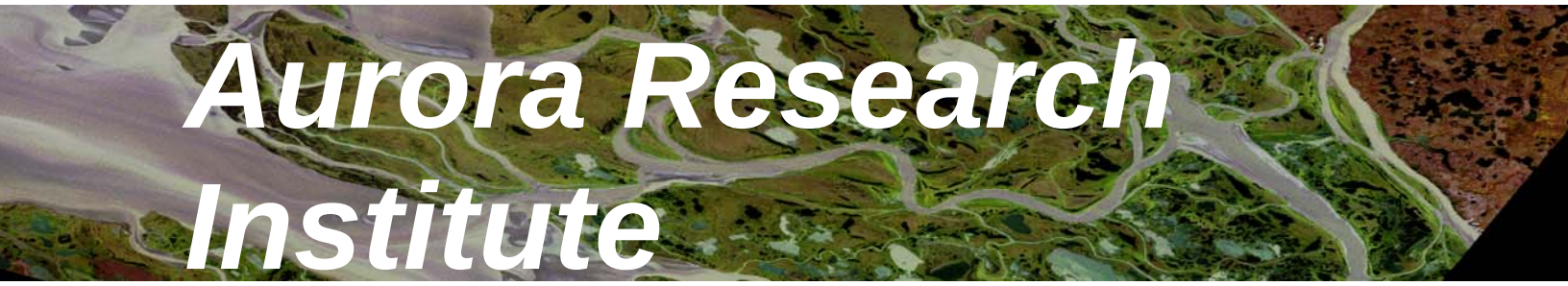


Figure 1: Land Claim Regions in the Northwest Territories (Aurora Research Institute)



Aurora Research Institute

The Aurora Research Institute (ARI) was established in 1995 as a division of Aurora College when the Science Institute of the Northwest Territories (NWT) divided into eastern (Nunavut) and western (NWT) divisions.

The Aurora Research Institute's mandate is to improve the quality of life for NWT residents by applying scientific, technological and indigenous knowledge to solve northern problems and advance social and economic goals.

ARI is responsible for:

- licensing and coordinating research in accordance with the NWT Scientists Act: this covers all disciplines including the physical, social, biological sciences and traditional knowledge;
- promoting communication between researchers and the people of the communities in which they work;
- promoting public awareness of the importance of science, technology and indigenous knowledge;
- fostering a scientific community within the NWT which recognizes and uses the traditional knowledge of northern aboriginal people;
- making scientific and indigenous knowledge available to the people of the NWT;
- supporting or conducting research and technological developments which contribute to the social, cultural and economic prosperity of the people of the NWT.

To learn more about ARI, contact us at:

Aurora Research Institute
PO Box 1450
Inuvik, NT X0E 0T0
Tel: 867-777-3298
Fax: 867-777-4264
E-mail: licence@nwtresearch.com
Website: www.nwtresearch.com

The Department of Environment and Natural Resources

The Department of Environment and Natural Resources (ENR), Government of the Northwest Territories (GNWT)'s mandate is to promote sustainable development through the management and protection of the quality, diversity and abundance of natural resources and the integrity of the environment.

With respect to permitting for research and monitoring, ENR is responsible for:

- Issuing Wildlife Research Permits under the Wildlife Act (Section 24) for all studies on wildlife or wildlife habitat in the Northwest Territories (NWT). Wildlife includes all vertabrates, except fish and marine mammals.

To learn more about ENR, contact us at:

Wildlife Division
Environment and Natural Resources
Government of the Northwest Territories
PO Box 1320
Yellowknife, NT X1A 2L9
Fax: 867-873-0293
E-mail: wildliferesearch_permit@gov.nt.ca
Website: www.nwtwildlife.com/ResearchPermits/

Northwest Territories Environment and Natural Resources

Prince of Wales Northern Heritage Centre

The Prince of Wales Northern Heritage Centre (PWNHC), a Division of the Department of Education, Culture and Employment, Government of the Northwest Territories, is responsible for managing and protecting the archaeological resources of the NWT. Representing a continuous human occupation stretching back over 7000 years, archaeological sites are fragile and non-renewable and are protected from disturbance by legislation, regulation, and policy in the NWT. There are currently about 6000 archaeological sites recorded in the NWT, though this number represents only a small fraction of the actual number of existing sites, as large areas remained unexplored for archaeological resources. A large part of our work at the PWNHC involves reviewing land use and development permit applications. We currently review, on average, 300 permits per year, providing advice to 9 land management authorities.

With respect to permitting for research and monitoring, PWNHC is responsible for:

- Issuing NWT Archaeology Research Permits

To learn more about The Prince of Wales Northern Heritage Centre, contact us at:

NWT Cultural Places Program
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4750 48th Street
PO Box 1320
Yellowknife, NT X1A 2L9
Phone: 867-873-7551
Fax: 867-873-0205
Email: archaeolog@gov.nt.ca
Website: www.pwnhc.ca

Northwest Territories Education, Culture and Employment

Department of Fisheries and Oceans

Fisheries and Oceans Canada (DFO) is responsible for developing and implementing policies and programs in support of Canada's scientific, ecological, social and economic interests in oceans and fresh waters. Some Fisheries management responsibilities have been delegated or transferred to other Federal agencies (e.g. Parks Canada), Provinces/Territories and co-management groups under Land Claim agreements.

DFO Fisheries Management is responsible for issuing Commercial, Domestic, Licence to Fish for Scientific Purposes (LFSP), Exploratory, Public Display and Educational licences in the NWT. Subject to Land Claim agreements, a Commercial licence is required to sell or barter fish.

All individuals fishing for scientific purposes, as described below, are required to obtain a Licence to Fish for Scientific Purposes (LFSP);

- Activities involving fishing, catching or attempting to catch fish;
- Activities where the potential exists for the incidental capture of fish;
- Sampling or possessing fish caught in a subsistence fishery.

For further information about licencing please contact DFO;

Licensing Officer
Central & Arctic Region
Government of Canada
Fisheries and Oceans Canada
PO Box 1871
Inuvik, NT X0E 0T0

Tel: (867) 777-7500 Fax: (867) 777-7501
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Website: http://www.dfo-mpo.gc.ca/index-eng.htm

Fisheries and Oceans Canada | Pêches et Océans Canada

2007 Licenced Research Projects

Biology

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File No: 12 402 797 **Licence No:** 14194
Region: NS, SS **Location:** In the general area of Kennady Lake (63.4453 N, 109.2119 W)

Gahcho Kue Project - Fisheries Baseline Studies
In the summer and fall of 2007, seven lakes and 25 streams were sampled for fish in the area of the De Beers Canada Inc. proposed Gahcho Kué Project, located at Kennady Lake, NT. This work was carried out during two visits, July 18 to 31 and August 24 to September 7. Fisheries sampling methods in the lakes included minnow traps, gill nets and electrofishing. Electrofishing was the primary method used for stream fisheries sampling. A total of 658 fish were captured in the summer including lake trout, Arctic grayling, northern pike and burbot. A total of 259 fish were captured in the fall.

The most commonly captured fish was slimy sculpin, followed by lake chub and Arctic grayling. Arctic grayling were captured in the streams in both summer and fall. The outmigration date from the streams likely occurs in the last week of August. Lake sampling confirmed the presence of northern pike in several of the tributary lakes to Kennady Lake, along with the presence of other species such as lake trout and Arctic grayling. Slimy sculpin from four locations were collected for metals analysis. Phytoplankton, zooplankton and benthic invertebrate samples were collected and archived for future analysis.

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File No: 12 402 799 **Licence No:** 14224
Region: SA **Location:** Nota Creek C-17 wellsite, which is located at 65º06'01" N 126º02'58" W in the Sahtu Region of the NWT.

Phytoremediation Study on the CDN Forest et al Nota Creek C-17 Wellsite
Previous work suggested the salt-impacted Nota Creek C-17 wellsite may be a suitable candidate for phytoremediation, a remediation strategy involving the use of plants to remove contaminants. In theory, plants would uptake the salt from the soil, then be harvested and removed from the site. This process would be repeated until the impacted soil is remediated to applicable guidelines. The first step to determining the suitability of this technology to the C-17 site was to collect soil samples and conduct benchtop testing (laboratory and greenhouse).

Soil samples were collected from the wellsite on August 9, 2007 and shipped to Waterloo Environmental Biotechnology Inc. for the benchtop testing. The soil properties were confirmed in the laboratory and then growth tests utilizing three different grass species were completed in the greenhouse under controlled conditions. The growth performance of untreated grass seed versus grass seed treated with various natural root associated bacteria was measured in control soil and salt impacted soils. The growth test results were encouraging. The treated grasses showed improved growth, improved general plant health, increased biomass and increased salt uptake versus the non-treated grasses. These positive results support proceeding with the planting of on-site test plots.

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File No: 12 402 503 **Licence No:** 14136
Region: GW **Location:** Approximately seven streams and lakes/ponds in the Gwich'in Settlement Area

Biological Studies of Waters Along the Proposed Mackenzie Gas Pipeline Route - Gwich'in Settlement Region
This study is designed to obtain baseline data on lakes and streams along the proposed Mackenzie Gas Project pipeline. In March 2007, the researher sampled 6 lakes, accessing each lake via helicopter. They used an ice auger to drill a hole through the ice and measured water quality (oxygen, pH, conductivity, etc.) and collected water samples for nutrient analyses and experiments. Plant nutrients were in very low concentrations with experimental studies showing that phytoplankton were nutrient limited. There was no oxygen in the water of Hill Lake, which is a shallow lake (sample depth 1.6 m). Other lakes showed evidence of a decrease in oxygen near the bottom although concentrations remained moderately high.

During late July 2007, the researchers sampled a small number of lakes and streams. Lake sampling included: water; sediments; benthic invertebrates; and plankton. Stream sampling included aquatic invertebrates and water. At Travaillant Lake, they collected small forage fish, aquatic invertebrates, and aquatic plants which are now being analyzed for stable isotopes and mercury and will complement an earlier study where mercury levels were determined in lake trout. The researchers conducted a series of nutrient limitation experiments and found that the phytoplankton communities were nutrient limited in summer.

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File No: 12 402 503 **Licence No:** 14156
Region: IN **Location:** Approximately 7 streams/channels and 7 lakes/ponds in the Inuvialuit Settlement Region.

Biological Studies of Waters along the Proposed Mackenzie Gas Pipeline Route - Inuvialuit Settlement Region
This study was designed to obtain baseline data on lakes and streams along the proposed Mackenzie Gas Project pipeline route. In July/August 2007, the researchers sampled twelve lakes (Noell, E. Hans, Parsons, Yaya, Mid, Trench, Old Trout, Kimialuk, Big, Denis Lagoon, and two unnamed), accessing each lake via float plane. Near the centre of each lake the researchers: 1) measured water quality (oxygen, pH, conductivity, etc.) with lake depth, 2) collected water samples for nutrient/metals analyses and experiments, 3) collected sediment samples for nutrient/metals analyses and benthic invertebrate composition/abundance determinations, and 4) collected plankton samples for composition/abundance analyses. Plant nutrient concentrations were very low, with experimental studies showing that phytoplankton were nutrient-limited. Lakes showed evidence of a decrease in oxygen near the bottom although concentrations remained moderately high. Most sample analyses from the 2007 field season are still ongoing.

Due to time and funding considerations, lake near-shore sampling and stream sampling was not conducted as initially proposed. Lakes indicated above were only sampled once in 2007.

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File No: 12 402 697 **Licence No:** 14168
Region: NS **Location:** Fortune Mineral's NICO property, along the route of a proposed all-weather access road and along the route of a proposed transmission line

Environmental Surveys of the Fortune Minerals NICO Project
The objectives of this research were to provide baseline environmental data along the route of the proposed development and all-weather road on Fortune Mineral's NICO property, and to determine the environmental impacts and mitigations of the development.

Environmental studies included: fish and fish habitat; water; benthic sediment; benthic invertebrate; vegetation surveys; and heritage resources surveys. Also, an automated meteorological station has been set up.

A fish survey was conducted within the area impacted by the mine footprint and along the proposed access road and transmission line. Various techniques including gillnets and traps will be used to collect samples. Habitat was inspected visually and depth measured with a depth sounder and measuring line. Water and benthic surveys were conducted downstream of development areas, to determine baseline limnology and water chemistry. Sediment and invertebrate samples were gathered with a composite of three 6" Ekman grabs.

Hydrology measurements were used to determine flow rates and seasonal changes. These were installed in the early summer and removed in the fall. Plant communities were identified and a rare plant survey was done by walking the area and documenting observations.

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File No: 12 402 781 **Licence No:** 14192
Region: IN **Location:** In the Parsons Lake vicinity.

Environmental Studies for the Proposed Parsons Lake Development Area During Summer 2007 - Vegetation Studies
ConocoPhillips Canada (North) Limited is conducting a monitoring study of biophysical parameters in the area of their proposed Parsons Lake natural gas development, approximately 70 km north of Inuvik, Northwest Territories. Monitoring of lichens is being conducted to assess the effects of proposed construction and natural gas production at the main facility, and compaction effects of the proposed alignment to be used for the transportation of goods and people to and from the area in winter. Sixty lichen plots have been established within 30 km of the proposed development, placed equally between inner, middle and outer zones. The vegetation program was completed in July - August 2007. ConocoPhillips based its activities out of Inuvik and accessed sampling locations by helicopter. The field work was carried out by two botanical specialists, a local assistant and a local wildlife monitor. Preconstruction information on lichen species composition was gathered and samples of yellow reindeer lichen (*Cladina mitis*), grey reindeer lichen (*Cladina rangiferina*) and black-footed reindeer lichen (*Cladina stygia*) were collected for determining concentrations in the study area. Additional data has been collected to document background growth rates of vegetation that is sensitive to changes in nitrogen.

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File No: 12 402 780 **Licence No:** 14113
Region: SA **Location:** Bosworth Creek

Bosworth Creek Monitoring Project
This project aimed to provide local high high-school students with hands-on science learning opportunities. Students gained experience in: 1) creating a species inventory; 2) identifying relationships between various species and tracking changes in populations that may occur over time; 3) testing biological samples for heavy metal contaminants; 4) determining and tracking water chemistry and quality; 5) identifying actual and potential fish breeding and rearing habitats; and 6) mapping stream bed morphology and recording any changes that may have occur over time.

The Bosworth Creek Project was initiated when the Sahtu Renewable Resources Board received a request for information on fish stocks in the creek by a local resident. It became apparent early on in the project that reliable

baseline data on this creek's aquatic community was incomplete. Recent restoration efforts have presented a unique opportunity for training local youth in scientific sampling techniques and recording methods, in tracking biological interactions and morphological changes that will likely occur over time, and in presenting data and conclusions through written reports and public presentations.

For 2007, acquiring baseline biological data continued with the collection and assessment of chemical components of the creek system. The monitoring project will continue to provide extensive professional development for the project team by academic and industry professionals. Updates on the project will also be provided through the Sahtu Renewable Resouces Board newsletter and website.

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File No: 12 402 789 **Licence No:** 14105
Region: NS **Location:** Daring Lake

Conceptual and Mechanisitic Models for the Development and Survival of the Trichostrongylid, *Ostertagia gruehneri*, in Barrenground Caribou, with Respect to Northern Climate Change
The objective of this research was to determine the effect of climate and climate change on *Ostertagia gruehneri*, an important parasite of caribou. This parasite lives in the stomach of caribou and can cause decreased food intake, weight loss, and reduced pregnancy rates in infected individuals. Adult worms produce eggs, which are shed in caribou feces. Once in the environment, larvae hatch from the eggs and go through 3 development stages (L1-3). At a certain point in development, larvae migrate onto surrounding vegetation where they can be accidentally ingested by grazing caribou and infect that individual. The rate of development in the environment is dependent on temperature and likely relative humidity. This fieldwork at Daring Lake investigated the development and survival of *O. gruehneri* on the tundra under natural and warmed conditions. Preliminary results suggest that small increases in temperature (~1oC) are not sufficient to alter the rate of development for *O. gruehneri*, but larger increases in temperature may have significant impacts on development. Laboratory experiments are planned for early 2008 and field studies will be continued in the summer of 2008.

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File No: 12 402 585 **Licence No:** 14161
Region: NS, SS **Location:** "km 0" (62° 32' 18.7" N - 113° 21' 30.9" W) to Lockhart Lake Camp (63° 37' 10.31" N - 112° 06' 35.242" W)

Seasonal Overland Winter Road
The Tibbitt to Contwoyto Winter Road Joint Venture is proposing the construction of a new, 159 km long seasonal overland road (SOR) from the end of the Ingraham Trail to the south shore of Lockhart Lake near the existing Camp. The SOR and its associated 14 bridges will comprise a new right-of-way on a route that is entirely located on the land but generally aligned with the existing Tibbitt to Contwoyto Winter Road route.

During the course of the aquatic studies sampling program along the proposed SOR route, EBA sampled fish species and their habitats, as well as benthic invertebrates and water quality, at selected potential watercourse crossing locations. Fish were found only in streams possessing moderate to high flows, suitable gravel/cobble substrates, and moderate to high dissolved oxygen (DO) levels. Some ephemeral watercourses possessing suitable substrates and draining waters with high dissolved oxygen levels were determined to possibly provide seasonal habitat for migrating or spawning fish. Wet lowland environments (i.e. bog and fens) typically exhibited low DO levels, which likely precluded the presence of fish.

Overall, water quality parameters found in SOR streams were typical of freshwater systems in the region. The general findings of the benthic invertebrate sampling program were that their populations and distributions were relatively uniform, and exhibited moderate diversity across the sampling sites.

An Ecological Land Classification (ELC) system was applied along the route to provide information on the vegetation

and plant communities. The ELC study area for the proposed SOR was approximately 20,790 ha and included a 500 metre buffer on either side of the proposed alignment. Mapping was generated by a combination of Light Detection and Ranging survey (LIDAR) and aerial imagery to a scale of 1:10,000. Nineteen vegetative units, three sparsely vegetated, four water units and two anthropogenic units were identified and mapped within the SOR study area.

Upland forest and woodland ecosystem types are dominant within the study area with spruce-lichen covering 32% and jack pine-lichen covering 23%. Lowland and riparian units comprised 17% of the total area. Treed bogs were the most common lowland unit accounting for 7% of the total study area; while scrub birch cloudberry low shrub bog and treed fen represented approximately 3% each. Tundra ecosystem types make up 5% of the study area.

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File No: 12 402 585 **Licence No:** 14221
Region: SA **Location:** At the MacTung Project area, which is located in the MacMillan Pass region of the Mackenzie Mountains, on the NT/Yukon border.

MacTung Project - 2007 Environmental Baseline Studies
North American Tungsten Corporation Ltd. (NATCL) is planning to develop a new tungsten mine (Mactung) on the border of the Northwest Territories and Yukon, in the MacMillan Pass area of the Mackenzie Mountains. This research represents based line environmental impact studies.

Fisheries and aquatic sampling was conducted at 11 stations within the study area between August 14, 2007 and August 18, 2007. On the NWT side of the border, a total of 5 stations were sampled on Dale Creek (FS1, FS5, and FS11), the Tsichu River (FS3), and Cirque Creek (FS2). Additionally, fish sampling was conducted in a downstream portion of the Tsichu River. Sampling included fish sampling by electrofishing, macroinvertebrate sampling by Hess sampler, and the sampling of water quality attributes.
Dale Creek was found to support both bull trout and slimy sculpin, and was found to provide excellent overall fish habitat availability. The benthic invertebrate community in Dale Creek was diverse and abundant, and water quality attributes were favourable. At the lower Tsichu River, poor invertebrate abundance and diversity, and only moderate quality fish habitat were observed. No fish were captured from either fisheries sampling location on this river. This watercourse appears to be at least seasonally unsuitable to fish, apparently due to poor water quality. Cirque creek was found to have suitable benthic community and water quality, but was not found to support fish. A lack of over-wintering habitat and barriers at the upstream and downstream ends are believed to restrict usage by fish.

EBA conducted a rare plant survey (RPS), trace element concentration sampling and an update of ecosystem land classification (ELC) from August 13 to August 15, 2007. The surveys were conducted in the area of the current proposed footprint for the Mactung Project entirely located in Yukon but included some work in the adjacent Northwest Territories. For the rare plant survey, two days of effort were conducted in the Yukon-based proposed development area and one day of effort was conducted in the NWT. A total of 31 plants species were identified as having a potential to occur within the local study area (LSA), 13 of these in Yukon and 18 in the NWT. In 2007, no rare species were observed in areas proposed for development. A baseline assessment of trace element concentrations (TEC) in plant tissue was also performed within the LSA. A total of 14 vegetation samples were collected, with two samples collected at each of seven sample locations. The analyses indicated that the vegetation samples collected in the NWT) had relatively high values for most metals in horsetail, as did the willow composite samples. These results were considered to be representative of the natural background conditions in the area.

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File No: 12 402 757 **Licence No:** 14206
Region: SA **Location:** Great Bear Lake near the town of Deline

Assessment of Lake Trout Stocks in Great Bear Lake
The objectives of this study were to: 1) gather baseline data on size and age structure, fecundity (egg number per female), growth and mortality of Dease, Smith, McVicar, McTavish, Keith arm lake trout. A different arm will be

sampled each year over a 5 year time period; 2) to determine if lake trout are genetically distinct between basins; 3) to determine the extent of movements (if any) by lake trout in Great Bear Lake by using molecular genetics.

The fish were caught using angling or gang gillnets set in Smith Arm. Location data such as position (determined by GPS), time of year, time of day, net depth, water temperature, weather and other environmental conditions were recorded for each set. To determine the catch-per-unit effort the net type, set time, lift time and soak time were recorded. The fork length, round weight, gonad weight, egg number per female, sex and maturity stage, structures for determining the age and stomach contents of each fish were taken. Sub-sampling of the carcasses for contaminants (mercury and radium) was also done.

A detailed report and oral presentation will be supplied at the SRRB annual meeting and the Deline RRC.

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File No: 12 402 791 **Licence No:** 14112
Region: NS SS **Location:** Snap Lake, Northeast Lake, King Lake outlet and Stream 27

De Beers Snap Lake Project- 2007 Monitoring Program
An environmental monitoring took place in 2007 within and around the 31 km radius of the De Beers Snap Lake Mine. The objective of the monitoring programs are to collect annual data pertaining to terrestrial and aquatic resources to monitor and compare Project related effects with the environmental assessment predictions and comply with the Project's regulatory requirements as outlined in the Project's Water License, Environmental Agreement, Land Use Permit, Fisheries Authorization and Land Leases.

Sampling was conducted by Golder Associates Ltd. around the site between February and October 2007. The aquatics program included water quality, sediment quality, benthic invertebrates, plankton, and fish health monitoring. The wildlife program included caribou, grizzly bear, wolverine, wolf and falcon surveys. Vegetation, air quality, and hydrology (surface water monitoring) studies also occurred on site.

Members of Aboriginal communities participated in facets of these studies and provided input on fish palatability, aquatic sampling, and wildlife surveys. Results of the programs will be submitted as part of the 2007 annual reporting requirements under the Project's Water License and Environmental Agreement.
These reports will become part of the public record.

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File No: 12 402 794 **Licence No:** 14182
Region: GW **Location:** Approximately 50 km southwest of Fort McPherson on the Dempster Highway

Efficiency and Water Relations in Boreal Conifers under 24 Hour Environmental Light Conditions
No research was pursued under this licence in the NWT however, research was done on the Yukon Border. The following is a summary related to this research. A baseline study was conducted in the summer of 2007 in the Rock River area of northern Yukon. Physiological measurements were taken of greenhouse-grown Yukon white spruce seedlings under local environmental conditions. Local air temperature and light intensity were measured hourly over a 24 hour period. The controlled study was conducted over the summer of 2008 at the University of Northern British Columbia's greenhouse. Arctic light, temperature and wind conditions were mimicked, and conifer seedlings (white spruce, lodgepole pine and subalpine fir) grown from arctic seed sources were divided into 4 water treatments ranging from well watered to not watered and two light treatments (continuous and ambient light conditions at 53.5ºN latitude). Physiological measurements were collected over a three week period with data compilation, cleaning and analyses currently under way. A final thesis report is expected to be completed by January of 2009.

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File No: 12 402 802 **Licence No:** 14261
Region: NS **Location:** Yellowknife, interviews by phone or in person with GNWT or MVEIRB members & staff only (most interviews outside the NWT though)

Caribou impact assessment and monitoring guidelines
The goal of this research project is to shed light on the issue of differentiating natural variation from project-related effects on caribou and develop terms of reference for Environmental Impact Statements for mineral development projects. The complexity of this issue is enormous and can only be overcome by obtaining a broad understanding of the variety factors that influence caribou population dynamics. Industrial development is only one of number of human and natural factors that have the potential to impact caribou populations.

The approach taken to developing the terms of reference is a systems approach, based on the principle that project effects cannot be predicted or verified without understanding the other factors influencing caribou. As a result, the terms of reference for caribou are longer and require both population level and site-specific data. Despite the more detailed requirements, this research will lead to more efficient and effective programs without necessarily requiring more work. Also, it is not the proponent's sole responsibility to collect all information. The terms of reference acknowledge the role of government in collecting and sharing data with industry as well as the role of industry in contributing to the government's caribou monitoring strategy.

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File No: 12 402 800 **Licence No:** 14238
Region: IN **Location:** Near Kellet River (72° 2' 3" N 124° 44' 41" W)

Community Based Qiviuq Collection
No research was pursued under this licence.

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File No: 12 402 606 **Licence No:** 14170
Region: NS **Location:** Within the Con Mine property and Yellowknife Bay, Great Slave Lake

Con Mine Environmental Effects Monitoring (EEM) Cycle 2
Golder Associates Ltd. was contracted by Miramar Con Mine Ltd. to collect field environmental, fish, and invertebrate data in 2007 for the Phase 2 Environmental Effects Monitoring (EEM) program for Con Mine as required under recently developed federal Metal Mining Effluent Regulations (MMER).

Sampling was conducted by Golder Associates Ltd. in and around Yellowknife Bay of Great Slave Lake, Northwest Territories, in August and September 2007. Jackfish Bay (downstream of the outfall for Con Mine) was sampled for fish and invertebrates because it is an area exposed to the mine effluent. A bay at Horseshoe Island was sampled for fish as the reference area that is not exposed to mine effluent. These sites were chosen based on similar fish habitat and species richness.

The field survey consisted of sampling fish and aquatic invertebrates from the exposure and reference areas, as well as conducting a characterization of the fish habitat at each site. The fish studies consisted of a population survey of small bodied fish at both sites. The target species was ninespine stickleback and spottail shiners (if found in abundance). A few northern pike were also sampled. Small bodied fish were sampled using a variety of gear (minnow traps and seine nets), and were processed for length, weight, age, liver weight and pathology, gonad weight and pathology, viscera arsenic concentration and whole body arsenic concentration. Pike were analyzed for overall health, age, mercury tissue concentration, and methyl mercury tissue concentration.

Aquatic invertebrates were sampled from Jackfish Bay (exposure area) and Kam Bay (another reference area) due to similar sediment characterization. An ekman grab was used to sample benthic invertebrates and sediment from each location. The invertebrate species abundance and richness, and the total biomass were evaluated for each study area. Field water quality was measured and sediment and water samples were collected and analyzed for total metals and organic compounds.

Data collected for the field survey was reported in the Phase 2 EEM final interpretative report submitted to Miramar Con Mine Ltd. and Environment Canada, in June 2008 as required under the Metal Mining Effluent Regulations (MMER).

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File No: 12 402 798 **Licence No:** 14219
Region: NS **Location:** In the study area between Damoti Lake and Ranji Lake, east of the Damoti Lake Camp (64 8' 33.56"N 115 7' 7.19"W).

Damoti Gold
The 2007 baseline field program built on the 2006 program and consisted of assessing the following: hydrology, surface water quality, sediment quality and aquatic resources, including secondary producers. The purpose of the program was to gather information on existing environmental conditions. In the absence of a specific and defined mine plan, the 2007 Field Program focused on those areas identified as most likely to be impacted by the proposed mine developments and associated infrastructure.

A continuous stream flow record could not be constructed for hydrometric stations S-02 and S-03 due to the lack of manual field measurements as a result of flow values too low to measure with standard stream flow equipment. However, a continuous stream flow record was constructed for hydrometric stations S-01, S-05 and S-06.

The trends in the hydrographs for each hydrometric station for 2006 and 2007 are unique (stream flow peaks occurring a different times), suggesting that these streams are more affected by the upstream lake hydrology (ice cover, drainage area) than regional climatic conditions.

Representative graphs have been created for each parameter that the weather station logged. Data from the meteorological station may be used in all future data analyses once multiple years have been logged. The weather station is currently in operation and was last downloaded on August 28th, 2007.

Stream water quality closely matched lake water quality. Lake L-03 generally had higher pH, conductivity, hardness, alkalinity, total dissolved solids (TDS) and total suspended solids (TSS) compared to other lake samples. Stream S-02 flows from L-03. Stream sample S-02 also had higher pH, conductivity, hardness, alkalinity, TDS, TSS and sulphate compared to other stream samples. Conversely, lake L-05 and stream S-06 generally had the lowest pH, conductivity, and hardness of the lake and stream samples. Stream S-06 flows from Ranji Lake.

Water quality in the adit generally met Canadian Council Ministers of the Environment, 2003b (CCME) guidelines. Both the July and August samples fell within the guidelines for pH, ammonia, nitrite, nitrate and cyanide. Sulphate concentrations (33.4 – 42.8 mg/L) are two to ten times those in stream and lake water. In both July and August, both the total and dissolved concentrations of aluminum and copper exceeded the CCME Guidelines of 0.1 and 0.002 mg/L respectively. A comparison of dissolved and total metals concentrations, for those metals above detection limits, indicates that metals are present primarily in the dissolved form. This is also reflected in the TDS and TSS concentrations.

Sediment samples were collected from L-03, L-04 and L-06 in late August 2007. Sediment samples were analysed for pH and 30 different metals; metals were compared to CCME guidelines for aquatic life. Copper was the only metal to exceed CCME guidelines. Exceedences were noted in lakes L-03 and L-04. Chromium levels were close to CCME guidelines in lake L-06.

A small number of fish were captured within the local study area. The most common species captured in streams and lakes was slimy sculpin (*Cottus cognatus*) and lake chub (*Couesius plumbeus*), respectively. No fish were captured at sites L-03, S-01 and S-02. A sub-sample of fish from the LSA were analysed for metals. Total mercury in fish tissue is regulated by Heath Canada for human consumption, with a guideline of 0.5 µg/g (0.5 ppm); wildlife consumption of

tissue with mercury is regulated by the CCME EQG with a guideline of 0.033 µg/g ww. There were no CCME exceedences in the fish tissue analysed. No changes were noted (since 2006 study) during the visual assessment of fish habitat in the study area. As a result there was no formal habitat assessment completed in 2007.

Benthic invertebrates were sampled from the following stream sites S-01, S-02, S-03, S-05 and S 06 in late August 2007. Due to the limited sample set and difficulty associated with sampling the organic stream-bed sites (S-01, S-02 and S-03), comparisons of richness and abundance per sample site is not necessarily indicative of overall richness and abundance within the study area. As seen in the previous years sampling, diptera (also known as the true flies) were the most abundant order found. Stream site S-03 was the richest and most abundant site for benthic invertebrates, with roughly 2000 individuals in a single sample covering a possible 24 different species. Roughly fifteen different orders were identified within the samples taken in 2007.

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File No: 12 402 788 **Licence No:** 14195
Region: GW **Location:** On the SW shore of Travaillant Lake; N of the lake in the Travaillant River, and S of the lake between Travaillant Lake and Andrew Lake.

Travaillant Lake Fish Population Assessment 2007
The Travaillant Lake system, located entirely within the Gwich'in Settlement Area (GSA) is an area of great cultural, traditional, and ecological importance. In light of proposed nearby industrial development, Travaillant Lake has become a focus of fisheries related studies. In this current study, the researchers were collecting information on the biological characteristics (e.g., age, length, weight), vital rates, and life history traits of important fish species, with a particular focus on broad and lake whitefish. They were also collecting baseline information on population abundance and species composition of all fish species captured. With future monitoring, this baseline information will permit the detection of changes in the fish abundance and population structure. This study was initiated in 2004 and is proposed to be carried out over a 5 year period. In 2007, the researchers sampled fish from Travaillant Lake for 10 days in July. They caught lake whitefish, broad whitefish, cisco spp., lake trout, and northern pike (324 fish total). The sampled fish were from the Travaillant River north of Travaillant Lake (inflow) and south of Travaillant Lake (outflow) in late October. We caught mostly broad and lake whitefish (with a few ciscoes), most of whom were in spawning condition (504 fish total).

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File No: 12 402 793 **Licence No:** 14158
Region: NS **Location:** Baker Creek, tributary of Yellowknife Bay, Great Slave Lake, NT.

Baker Creek Fish Monitoring Plan
As a condition of the Authorization for Work and Undertaking Affecting Fish Habitat (YK-06-0063) in a small section of Baker Creek within the Giant Mine site, Indian and Northern Affairs Canada agreed to monitor the performance of Baker Creek for the spawning success of grayling, northern pike and suckers. Monitoring and fish surveys commenced on May 25, 2007 and continued until June 27, 2007 by which time all grayling including young of the year had out-migrated from the creek to the lake.

Sampling included capture and observations of migrating adults, eggs, larvae, as well as measurements/observations of habitat conditions at sites occupied by the various life stages. This work showed that the specially constructed grayling spawning habitat constructed in Reach 4 of Baker Creek performed extremely well with successful spawning, hatching and survival of large numbers of young of the year grayling. In addition, the work indicates that in the future, Baker Creek, with intact riparian areas, healthy channel morphology and unimpeded access should have a high abundance of both Arctic grayling and possibly longnose suckers. As shown by the recent remediation of Reach 4 of Baker Creek, habitat management can be the best instrument for successful fish restoration and conservation.

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Region: NS, SS **Location:** Lac de Gras

Diavik Diamond Mines Inc. Shoal Habitat Utilization Study 2007
The major objectives of this study were: to provide annual documentation of shoal habitat use by Lake Trout in the vicinity of the mine site and to ground truth hydroacustic equipment by capturing fish to identify species, collect life history data, tag, and then release.

Study locations for 2007 were the same as 2006 and (along the A154 dike). In 2007, the attempt to standardize a fish collection protocol at each shoal to "ground truth" hydroacoustic surveys continued as per the 2006 program. The intent was to determine an appropriate fixed interval for angling that would yield about 6 fish per shoal. Each lake trout caught was processed immediately for length, weight, species, and maturity, tagged and released. The location of the catch was recorded with GPS. The final report was sent out to Communities and Government for review and comment.

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File No: 12 402 797 **Licence No:** 14212
Region: GW **Location:** Arctic Red River and Peel River

Testing molecular and otolith tools to investigate population-of-origin and migration in Arctic cisco found in the Colville River, Alaska
A total of 117 Arctic ciscoes (locally called herring) were collected from the Arctic Red and Peel rivers from 8-16 August 2007. Local hires from Inuvik, Fort McPherson, and Tsiigehtchic assisted researchers from the USGS – Alaska Science Center to make sample collections of fish from each river. Arctic ciscoes were caught using 3-inch stretched mesh monofilament gill nets. Heads of all 117 arctic ciscoes were collected for subsequent laboratory analyses. Meat from all fish collected was salvaged, placed on ice, and distributed to members of the local communities. Samples are currently being analyzed at the USGS – Alaska Science Center in Anchorage, Alaska using genetic and otolith microchemistry techniques. Results may help researchers and members of northern communities to better understand the population of origin and movement of overwintering fish collected in the Colville River, Alaska subsistence fishery which are thought to spawn in tributaries of the Mackenzie River, Northwest Territories.

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File No: 12 402 412 **Licence No:** 14209
Region: SS **Location:** Forest stands adjacent to and along Hwy #5, inside and outside Wood Buffalo National Park, between Angus Tower and the road to Thebacha Campground.

Structure and Carbon Dynamics of Boreal Forests
As rapid melting of the arctic ice suggests, the trend of warming climate has been progressing in the arctic regions. The same trend must have been affecting ecology of boreal forests. To confirm this hypothesis, the researchers have been measuring movement of carbon in jack pine forests of Wood Buffalo National Park. Carbon is the major element that moves into and out of the forests. What is necessary to quantify are the amounts of tree growth, amount of leaves and branches that fall from the trees, growth and death of tree roots, etc. They have been measuring these quantities in three stands of different tree age since 2002, and have begun to see the general patterns. Particularly of

interest in the work of 2007 is confirmation of the large amount of root growth in these forests. For example, in a 40-year-old forest, 90% of carbon that moves from aboveground part of the forest to belowground is transferred as growth of fine roots, and only 10% is transferred as falling dead leaves and branches. This discovery suggests importance of roots in carbon dynamics of boreal forests. Accordingly, future plans will include focusing the study to fine roots.

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File No: 12 402 787 **Licence No:** 14217
Region: DC, SS **Location:** In areas around Fort Liard, Jean Marie River and Hay River, and at sites accessed from the road between Hay River and Fort Resolution.

Northern Native Plant Development Collections in the NWT
In August, 2007, 99 seed collections were gathered from 35 different plant species in the Deh Cho and South Slave regions of the Northwest Territories. Specifically, collections were made near the communities of Fort Liard, Jean Marie River, Fort Resolution, and Hay River, all within boundaries specified in the research licence and collection permits.

Seeds were collected from a variety of habitats, such as gravel pits, river banks, abandoned clearings, old burn sites, and forested areas. Species collected were chosen from a list developed by the Aurora Research Institute (ARI) in 2006 which identifies plant species suitable for revegetation purposes in the NWT. The majority of the species collected were grasses, legumes and forbs.

Seed samples were gathered by hand, and sample size varied with seed type and ease of collection. Voucher plant specimens were also obtained for each seed collection that was made. All of the voucher specimens will be mounted and kept in the ARI herbarium in Inuvik. All seed collections were brought back to ARI where they were dried at temperatures between 20 and 30˚C. The collections were then sent to Alberta Research Council in October where they continue to be cleaned, evaluated, and grown by technicians in the plant development division.

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File No: 12 402 752 **Licence No:** 14163
Region: SS **Location:** Fox Holes Lakes (60°03'N, 112°27'W)

Molecular analysis of evolutionary change in stickleback populations
The broad objective of this research is to find the genes that control skeletal growth in wild populations of stickleback fish. The ninespine stickleback fish at Fox Holes Lakes are unique because one set of fins (the pelvic or hind-fins) does not develop properly. Identification of the gene(s) responsible for this change will lead to a greater understanding of skeletal development in general. For three days in June 2007, sticklebacks were collected at Fox Holes Lakes using wire mesh minnow traps. Fish were difficult to catch this year, and only 35 ninespine sticklebacks and 50 brook sticklebacks were trapped. These low numbers may be due to low water levels at the usual trapping locations. These fish were then transported to the University of Utah and used for experiments to help identify the genetic causes of their fin loss.

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File No: 12 402 795 **Licence No:** 14187
Region: NS, SS **Location:** In the general area of Kennady Lake (63.4453 N, 109.2119 W).

Gahcho Kué Project - Vegetation Baseline Studies
A continuation of the 2005 plant tissue sampling program for the characterization of baseline metal concentrations in plant tissues was carried out in 2007 in the area of the De Beers Canada Inc. proposed Gahcho Kué Project located at Kennady Lake, NT. This work was carried out August 14 – 17.

Samples were collected from ecosystem types that were common to and representative of the Local Study Area, and emphasized the proposed Project footprint. Samples were collected from six locations: three from the Scrub Birch – Labrador Tea Tundra unit and three from the Scrub Birch – Crowberry Tundra unit.

Plant species were selected using the following criteria:
- broad occurrence in the area;
- value for human and/or wildlife consumption; and
- value as reclamation species.

A total of eight species were collected in 2007 and included several lichen species which were not collected in 2005. The full list of species can be provided upon request. Plant tissue metal concentrations will be used for future monitoring during the operations and closure phases for the proposed project if approval is granted and it is constructed.

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File No: 12 404 535 **Licence No:** 14104
Region: NS **Location:** At Baker Creek Basin

Investigations of the water cycle and hydrological processes of the subarctic Canadian Shield
It is the objective of this research to determine the water cycle processes acting in lakes and streams that could affect the stream flow response of Baker Creek and similar streams. A second objective is to understand how processes acting over smaller areas influence those that are predominant over larger areas.

Field activities in 2007 began with spring snow surveys and the activation of climate towers and water level stations in April. Soil moisture sensors were installed at the wells placed in the fall of 2006. Stream flow measurements were made at the water level stations during the next site visit in June. At that time, water temperature sensors were added to Landing and Vital Lakes as part of an effort to complement ongoing measurements of evaporation over land with measurements over lakes. In September, a sub-catchment of Vital Lake was selected for more detailed study by students at the University of Saskatchewan. A climate station and several wells were installed in three wetlands in the sub-catchment. The tent platform and frame were built in anticipation of the 2008 field season. Quickbird and Radarsat satellite imagery was taken over the summer. These images will be classified in an attempt to measure how the extent of saturated surface areas changes during the spring and summer. Notable results from 2007 include discovery that most of the depressional storage capacity in the watershed is in the soil below forests and wetlands. The manner with which this water is transferred to the basin outlet from some wetlands is unclear, as groundwater in wetlands below lakes does not have comparable chemistry to the lake water that flows into them. Water budget and hydrological process studies in 2008 will address this question, in particular.

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File No: 12 402 792 **Licence No:** 14141
Region: GW **Location:** Specific sampling sites will be identified by the local RRCs and the fishers themselves

Investigation into the occurrence of abnormal loche livers in the Gwich'in Settlement Area (GSA), Northwest Territories
Loche were collected mostly during the fall (between October and December 2007) with a line and hook through the ice near the communities of Inuvik, Aklavik,Tsiigehtchic and Fort McPherson. Spring sampling was attempted but

unsuccessful. A local fish monitor was hired to assist with identifying fishing locations, fish collection, categorization of liver appearance and fish sampling. Youth were also hired, when available, to assist with fish collection and sampling. A total of 136 fish were sampled (25 from Inuvik, 33 from Aklavik, 28 from Tsiigehtchic and 50 from Fort McPherson). Biological measurements were taken from each fish sampled. Samples were sent to Environment Canada to be analysed for organochlorines, metals, age, and stable isotopes. The contaminant samples were categorized according to liver appearance. The results of this study should be available by fall 2008.

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File No: 12 402 707 **Licence No:** 14140
Region: SS **Location:** Selected portions of Trudel Creek and Talston River

Aquatic and Fisheries Assessments for a Minimum Flow Threshold for Trudel Creek
The objective of the proposed work was to collect information on the fish community and fish habitat present in Trudel Creek, and identify the possible positive and negative impacts of reducing flow into the creek if the Taltson Hydro Project is expanded.

The field survey of the fish habitat and community of Trudel Creek and a section of the Taltson River took place in spring. Fish community and habitat surveys were carried out from an inflatable zodiac equipped with a motor. Habitat surveys were carried out using a range of measuring, photographic and GPS equipment. Fish community surveys predominantly entailed the use of gillnets with varying mesh size. Other methods will included: beach seines, minnow traps, electrofishing, angling and snorkelling.

A final report based on the results of this study will be made publicly available by Northwest Territories Energy Corporation.

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File No: 12 402 765 **Licence No:** 14144
Region: NS **Location:** Matthew Lake, Sandy Lake, an unnamed pond, an unnamed stream, and habitat surrounding these features.

2007 Field Monitoring - Matthews Lake and Area Fish Habitat Restoration and Enhancement Project
Overall, habitat compensation measures of this project continue to be successful. Three years post-construction, the enhanced Salmita lakeshore shows increasing habitat value compared to the unaltered lakeshore. Benthic invertebrates were more abundant and willow and fireweed growth improved vegetative cover. A winter access road had disturbed a portion of the enhanced habitat, but two new fingers were built to compensate for the damage.

Spawning activity was not observed in Pond B, but several fish species (Arctic grayling, lake trout and spoonhead sculpin) use the bay for rearing. Vegetation transplanted to the lake-pond inlet showed similar or increased survival from 2005 to 2007. Water depth across the inlet was shallower, and this suggests an overall system-wide water level decrease.

Spawning was not observed at Stream B, likely due to survey timing. More (118 vs. 67) small Arctic grayling were found within the enhanced site in 2007 than 2005. Broken flat rocks placed in the ford in 2004 were replaced. Transplanted vegetation showed high survivorship and widespread natural regeneration. Bank stability remained good.

Debris removal sites at Sandy Lake matched the natural Sandy Lake shore conditions. Matthews Lake sites could not be assessed because of INAC reclamation work at Tundra Mine.

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File No: 12 402 766 **Licence No:** 14162
Region: NS **Location:** Over 80 lakes and nearly 60 streams in the region 64° 27' - 64° 55'N by 109° 59' - 110° 53'W

2007 Aquatic Monitoring Program
The objectives of the proposed fieldwork was to characterize baseline and post-baseline conditions in the lakes and streams near mining activity. Anticipating future development, baseline data was collected in Lac du Sauvage. The tenth year of post-baseline data was also collected in the Koala Watershed, the ninth year of monitoring the fish populations of the Panda Diversion Channel (PDC), and the seventh year of post baseline data collected in the King-Cujo Watershed. The PDC was compared with two nearby natural streams to assess its habitat. Monitored parameters for all areas include some or all of the following: hydrology; meteorology; water quality; limnology; sediment quality; phytoplankton; zooplankton; benthos; fish habitat; and fish communities (physical characteristics and sampling of tissue for metals analysis).

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File No: 12 402 770 **Licence No:** 14151
Region: IN, GW **Location:** Within the Inuvik Community Greenhouse and at field trial sites within the Inuvik Town limits.

Northern Native Seed Development Greenhouse and Field Trials
In 2007, the Inuvik Community Greenhouse conducted germination trials on 35 seed collections of 20 plant species native to the Inuvik area. The collections with greater than 70% germination included six collections of grass, five collections of legumes and four collections of forbs.

At the end of the summer, seedlings from several of the collections were transplanted into field plots for further assessment of growth, vigour, flower production, and winter survival. These assessments will be done in 2008. The three field plots are located within the municipal boundaries of Inuvik, and occur on pre-existing disturbances: an old gravel pit, a clay slope, and a fire break with organic soils.

The survival, growth, and flower production of transplants from the 2006 field season were assessed monthly during the summer of 2007. When grouped together, survival of the 2006 transplants was high at all sites (> 85%), and the proportion of transplants that flowered was similar at all sites (approximately 50% of the surviving transplants flowered). However, individual collections differed in both their transplant survival and proportion flowering, and the vigour of the each collection showed significant differences across the three sites.

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File No: 12 402 779 **Licence No:** 14175
Region: IN, GW **Location:** Inuvik, Tuktoyaktuk, Sachs Harbour, Holman, Paulatuk, Aklavik, Tsiigehtchic, Fort McPherson

2007 Canada Western Arctic Germ Plasm Collection
No research was pursued under this licence.

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Region: NS **Location:** Diavik Diamond Mine - Lac de Gras, NT

Aquatic Effects Monitoring Program 2007
The purpose of the 2007 AEMP was to initiate a long term aquatics sampling program in order to produce a data-set that will be used in trend analyses to track the overall effects of the project on the aquatic ecosystem of Lac de Gras and to confirm predictions made during the EA. This will be achieved by conducting consistent annual sampling at fixed mid-field and far-field stations for which baseline conditions have already been established.

Fixed stations were visited by boat and by snow machine over the year. At each station water samples were be at three depths for full chemical analyses including major ions, trace metals, and nutrients using the lowest commercially available analytical detection limits. Only during the summer sampling sessions, each of the stations were sampled for zooplankton, phytoplankton biomass, plus taxonomy, benthic analyses and sediment chemistry. In addition, Slimy Scuplin's was collected and sent for metal analysis, plus non-lethal sampling was conducted to collect age, length, weight, sex, and other physical features and returned back to the lake.

Contaminants

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File No: 12 404 685 **Licence No:** 14242
Region: IN **Location:** Unipkat I-22, which is located along the eastern bank of Arvoknar Channel in the Mackenzie Delta (69°11'36.07"N 135°20'33.88"W).

Proposed Unipkat I-22 Phase II Environmental Site Assessment
A Phase II ESA was completed at the former Unipkat I-22 wellsite. This site is located in the outer Mackenzie Delta adjacent to Arvoknar Channel. The well was drilled in 1972/73 by Shell Canada. The objective of the research was to locate and delineate the drilling sump, evaluate soil, groundwater, and thermal conditions at the site in relation to the sump, and if appropriate, identify and quantify the extend of contamination resulting from historic operations at the site.

The scope of work for the ESA included the following tasks:

- locating drilling sump by advancement of 85 boreholes;
- locating (visually) other onsite disposal areas, such as flare pit and camp sump;
- soil sampling of areas potentially impacted by contaminants, and delineation of these areas if necessary;
- installation and sampling of 10 groundwater wells;
- installation of 3 thermistors; and,
- installation of 2 onsite benchmarks to be used to monitor shoreline erosion.

Site activities indicate that the drill sump was “L” shaped with the main leg 46 m x 26 m x 2 m, and the end piece 21 m x 20 m x 2 m. The volume of drilling waste contained in the sump is estimated at approximately 3000 m^3. A remediation plan for the site is currently being created.

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File No: 12 402 773 **Licence No:** 14236
Region: GW **Location:** On different sites off the Dempster Highway on the Richardson Mountains, 20 km south west of Fort McPherson to the border with the Yukon Territory.

Using Quantitative Fatty Acid Signature Analysis to Investigate Diet and Mercury in Porcupine Caribou
The researcher could not sample caribou last fall as they did not come by Old Crow. Thus no research was pursued under this licence.

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File No: 12 402 503 **Licence No:** 14185
Region: SA, SS **Location:** On the Great Slave Lake near Lutsel K'e, Fort Resolution and Hay River, and on the Great Bear Lake, Lac Ste. Therese and Birch Lake near Deline.

Spatial and long-term trends in persistent organic contaminants and metals in lake trout and burbot from the Northwest Territories
This study is designed to determine whether contaminant levels are changing in fish in the Northwest Territories, with a focus on Great Slave Lake. As in past years, lake trout were collected from Great Slave Lake near Lutsel K'e (East Arm) and Hay River (West Basin), and burbot from near Fort Resolution (West Basin). Fish were also collected from Great Bear Lake (lake trout) and Lac Ste. Therese (lake trout and walleye), but were not collected from Birch Lake as originally planned.

The West Basin lake trout were collected by the Hay River commercial fisheries, while all other fish were collected by local community members. Collected fish were frozen and then shipped south to Environment Canada-Saskatoon, where they were processed and sampled. Determinations were made of length, weight, sex, liver weight, gonad weight, stomach contents, and muscle moisture content. Muscle, liver, stomach, and otolith (lake trout and burbot) or dorsal spine (walleye) samples were collected from each fish. Otoliths and dorsal spines were sent to a private contractor for the determination of fish age. Tissue samples were submitted to Environment Canada laboratories in Saskatoon and Burlington for stable isotope (muscle) and contaminant analyses (metals in lake trout, walleye and burbot muscle; organic contaminants in lake trout muscle and burbot liver).

Data received from these various analyses will strengthen Environment Canada's expanding dataset and will prove to be very valuable in investigating whether contaminant levels in fish are changing over time, and whether they differ among locations.

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File No: 12 402 503 **Licence No:** 14233
Region: IN **Location:** In the Paulatuk region.

Temporal trends and spatial variations in persistent organic pollutants and metals in sea-run char from the Canadian Arctic
No reseach was conducted under this licence.

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File No: 12 404 644 **Licence No:** 14115
Region: NS **Location:** Giant Mine (10km north of the City of Yellowknife)

Mobility and Speciation of Antimony and Arsenic in the Aqueous Environment around the Giant Mine
No work was pursued under this licecne.

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File No: 12 402 758 **Licence No:** 14189
Region: GW, SS **Location:** Richardson Mountains, 20K SW of Fort McPherson (67° 18' 38" N 135° 0' 17" W)

Metals Uptake from Vegetation to Caribou in the Canadian Arctic
This project aims to look at bio-accumulation of contaminants in a northern food-chain: vegetation – caribou- wolves. The contaminants in question are perfluorinated compounds. These compounds are emerging contaminants of concern in the Arctic, and they have been found in relatively high concentrations in caribou from the Canadian north. However, information is lacking as to the degree to which they bioaccumulate in food-webs. The vegetation – caribou – wolf chain is a good model to test bioaccumulation, thanks to its simplicity; it is linear (a chain rather then a web), and is well- separated in food (trophic) levels.

Caribou foods, i.e. plants and lichens will be sampled in the range of the Porcupine caribou herd in north-west Northwest Territories, and Yukon. Caribou samples will be provided from an ongoing NCP program to monitor contaminants in caribou in northern Canada. Wolf samples will be collected from trappers from northern Yukon. Levels of perfluorinated compounds will be measured in caribou foods, caribou, and wolves. The levels will show if these compunds are accumulating through the food chain increasing from vegetation to caribou to wolves. We will also use an additional analysis (stable isotope ratios and fatty acid profiles) to potentially determine how much of each food the caribou are eating, and likewise what is the relative part of caribou in the wolf diet. We will also analyze some archived Porcupine caribou tissues to determine whether diet and the level of perfluorinated compounds has changed over the last nine years, and whether it changes between spring and fall.

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File No: 12 402 758 **Licence No:** 14196
Region: SS, DC **Location:** at the area from Pine Point to Fort Resolution, and from Pine Point to Hay River.

Contaminants in Medicinal Plants: Labrador Tea
The objectives of this project were to determine the levels of lead, zinc, iron copper and other metals in Labrador Tea in the area between Hay River and Fort Resolution, in the vicinity of the Pine Point, a closed lead/zinc mine; to evaluate the metal contribution due to mining activity and to natural soil levels, and to calculate the decline in lead contamination with distance from the mine.

Samples were collected from eight sites along the road from Pine Point to Fort Resolution, approximately every 5 km. Nine sites were sampled approximately every 10 km along the railway line from Pine Point to Hay River. Plants were sampled at least 200 m from the road or railway. Sampling alternated between the down hill side and the uphill side of the road (closer and further from the Great Slave Lake, correspondingly). Sediment samples were taken from four river beds of rivers transecting the road and railway to see if ores are washing into the Great Slave Lake,. Collection sites were selected according to distance from the mine, and favourite harvest sites of community members. Sampling was taken at various distances along the road as much as possible at a fix distance perpendicular to the road, since the road is speculated to be a transport route.

Plenty of traditional knowledge exists about Labrador Tea, as it is used traditionally both as tea and as medicine. Boiled samples were prepared according to traditional protocols, so that lead levels in the samples will correspond to levels consumed by residents. The effectiveness of traditional preparations to extract minerals from the plant will be assessed by comparing the concentrations of nutrients and minerals in the leaves and in tea.

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File No: 12 404 672 **Licence No:** 14137
Region: GW **Location:** About 15 km south of Inuvik, several hundred metres off the Dempster Highway (68 degrees 19' N and 133 degrees 25' W).

Lithogenic elements and isotopes in peat cores as markers of Holocene climate changes in the Mackenzie River valley
The goal of this project was to take a core from a peat bog located near Inuvik, and analyse it for elements and dusts deposited from the air over the last 7,000 years. From this the researchers will reconstruct climate change information

as well as recent industrial mercury and lead pollution histories for Inuvik and the lower Mackenzie River valley.

In May 2007, a team from the Geological Survey of Canada, Agriculture Canada, Indian and Northern Affairs Canada and the University of Heidelberg, Germany, visited Inuvik and retrieved six peat cores ranging in length from 1.5 to 2.6 metres, from three peat bogs along the highway south-east of town. They selected one of these cores for intensive analysis, and sent it to the University of Heidelberg.

The core has been sliced at 1 cm intervals, and selected plant specimens from 6 depths ranging from 30 cm to 1.5 m have been dated by radiocarbon decay and 210 lead measurements. The analyses revealed a consistent chronology of peat growth starting at 5,500 year before present at 1.5 metres, with a cessation of peat growth approximately 400 years ago. Active peat growth has only within the last 40-50 years begun again, meaning that there is a gap in the peat record of atmospheric dusts from about 1600 A.D. until about 1950 A.D. Other analyses of carbon content, mercury and other trace elements have also been completed in German and Canadian laboratories, and the interpretation of these data has begun. Plant species identification has been completed, on samples from 6 different depths to give a regular picture of plant compositional change over 5,000 years at this site. Analyses for stable isotopes of oxygen and carbon, which may provide more definitive climate record.

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File No: 12 402 801 **Licence No:** 14244
Region: DC **Location:** At 8 sites immediately adjacent to each of the two mines located within the South Nahanni Watershed: Cantung Mine and Prairie Creek Exploration Camp.

Development and application of monitoring tools to quantify the effects of mining on the health of rivers in the South Nahanni Watershed (NWT)
The objective of work completed in 2007 study was to identify an ecological indicator capable of monitoring changes in loadings of metals in streams in the South Nahanni Watershed.

In September of 2007 our four-member field crew completed field studies at 7 sites located adjacent to the Canadian Zinc mine located at Prairie Creek, and at seven sites adjacent to the North American Tungsten mine located on the Flat River in the South Nahanni Watershed. Sampling sites were located adjacent to the main discharge at each mine site, and at 3 locations upstream and downstream of the mine. At each site, my research team collected samples of water, riverbed sediments, benthic algae, benthic invertebrates and slimy sculpin for analyses.

Concentrations of metals including aluminum, arsenic, cadmium, copper, lead, magnesium, mercury, tungsten and zinc in water, sediment, algae, invertebrate and fish will be determined by the Saskatchewan Research Council. The final report will be completed by May 2008. Data and interpretations within the report will provide resource and land managers with options on how to monitor levels of metals in streams in the South Nahanni Watershed. This information could also serve as the basis of a long-term program to monitor the ecological health of streams in the South Nahanni Watershed.

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File No: 12 402 778 **Licence No:** 14207
Region: SA **Location:** Port Radium Mine (abandoned), Contact Lake Mine (abandoned) and El Bonanza Mine (abandoned).

Contaminated Site Environmental Monitoring - Port Radium, Contact Lake and El Bonanza Historic Mining Properties
The project involved ongoing supplementary environmental investigations at the Port Radium, Contact Lake and El Bonanza historic mining properties. Indian and Northern Affairs Canada is responsible for managing these abandoned sites. Depending on the site under investigation, the monitoring and sampling work included one or more

rounds of surface water and sediment sampling, waste rock sampling, soil sampling, collection of paint and wood samples from tanks and structures, and visual inspections. This information was collected to supplement the state of knowledge on the conditions at each of the sites, including the mine openings, infrastructure and general site conditions. The work involved manual sampling and measurement with minimal disturbance of site conditions.

This program confirmed the findings of the 2006 site assessments and the assumptions used in the associated human health and ecological risk assessments for these sites. While some on-site impacts have been noted, the sites are having minimal effects on the off-site environment and receiving waters. The information collected from the 2007 program was used in combination with prior information to generate the Remedial Action Plan for the Contact Lake and El Bonanza sites. The 2007 monitoring results at the Port Radium Site will be used as part of the Port Radium dataset.

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File No: 12 402 778 **Licence No:** 14237
Region: NS **Location:** At the Indore Mine (in Hottah Lake), Hottah Mine (on Beaverlodge Lake) and North Incaf Mine (on Indin Lake).

Contaminated Site Environmental Monitoring and Assessment - Indore, Hottah, and North Inca Historic Mining Operations
The 2007 assessment program involved environmental investigations at the North Inca (Inden Lake), Indore (Hottah Lake) and Hottah (Beaverlodge Lake) historic mining properties which are under the custodial care of Indian and Northern Affairs Canada (INAC). The activities carried out in the course of the assessment program included: water quality sampling; sediment sampling (Indore only); terrestrial vegetation and soil sampling; waste rock characterization; tailings characterization (Indore only); sampling of areas potentially impacted by petroleum hydrocarbons; hydrology/hydrogeology features identification; characterization of physical conditions; geotechnical and crown-pillar assessment; and borrow material and landfill capacity assessment. The work involved manual sampling and measurement with minimal disturbance of site conditions.

Based on a thorough evaluation of the results, the sites are not believed to be having a significant impact on human health or the environment. Using the information collected to date, INAC will develop the Remedial Action Plans (RAPs) for the sound management of the sites. The findings of the 2007 field program for the North Inca site were presented at community consultations held in Yellowknife in December 2007as part of the development of the RAP for the North Inca mine site.

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File No: 12 404 671 **Licence No:** 14135
Region: NS **Location:** Giant Mine area

Speciation of Arsenic in Yellowknife, NT Soils
During the April 2007 field campaign, surface and satellite based passive microwave datasets were acquired along with spatially and temporally correspondent in-situ snow cover measurements. A suite of Environment Canada's ground radiometers were deployed in the vicinity of the Daring Lake research camp. The very high resolution (2 m) ground based data was very useful for examining how sub-grid features effect course resolution satellite measurements. Detailed ground measurements of snow cover properties were acquired in conjunction with the ground based radiometers at fixed sites and along transects. Other snow data were acquired at sampling sites chosen based on previous years sampling locations.

Preliminary results of snow cover data analysis from the 2003 through 2007 field seasons were presented at the 64th Eastern Snow Conference in St. John's Newfoundland in June of 2007. Topography and wind velocity were shown to have a strong control on snow deposition in a tundra environment. Regionally uniform landscapes, such as, lakes and flat tundra were found to have the least variable snow cover properties. Sites located on slopes were consistently the

most variable. The ratio of SWE on flat tundra to other landscape types was shown to be useful for characterizing inter-annual similarities. Results of on-going analysis on multi-scale airborne and ground based passive microwave data, collected in 2005 and 2007, were presented at the IEEE IGARSS Conference in Barcelona Spain in July 2007. It was shown to be possible to estimate SWE over homogenous flat tundra with high resolution sensors (2m and 50m). However, over lakes, deep snowpacks and when larger heterogeneous pixels are considered, the ability to estimate SWE breaks down and there is a significant underestimation of actual SWE. The analysis of these multi-scale data has been critical for developing improved algorithms that consider lake area, complex terrain and regional scale heterogeneous pixels.

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File No: 12 406 046 **Licence No:** 14089
Region: SA **Location:** Within the pipeline study corridor of the Tulita District of the Sahtu Settlement Area

2007 Winter Field Geotechnical Investigation Program in the Sahtu Settlement Area - Tulita District
The 2007 Winter Field Geotechnical Investigation Program (in the Sahtu Settlement Area-Tulita District (SSA-T) was conducted between January 9 and March 20, 2007. The objective of this program was to gather information on the soil and ground conditions on or adjacent to a potential pipeline right-of-way in the Mackenzie Valley. This information is required in order to determine the availability of suitable granular materials for pipeline construction, to facilitate the design of the pipeline and pilings and foundations of structures and for the preparation of subsequent regulatory applications. Over the course of the program, information was collected from 13 borrow sources, one frost heave site, two watercourse crossing site, one facility site and one infrastructure site.

Twelve boreholes were drilled and 50 test pits were excavated at the 13 proposed borrow sources. Three boreholes were drilling and three test pits were excavated at the infrastructure site, 11 boreholes were drilled at the frost heave and watercourse crossing sites, and eight boreholes were drilling at the facility site.

Total expenditures for the program are approximately $12.0 million. Sub-contracts accounted for approximately $10.0 million, CoItKBR labour about $2.0 million, and fuel for the drilling equipment and camps were about $340,000. Over 29,500 hours were worked by the community monitors, subcontractors and CoItKBR personnel (95 people) without any medical or lost-time injuries.

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Region: SA **Location:** Within the pipeline study corridor of the K'asho Gotine District of the Sahtu Settlement Area

2007 Winter Field Geotechnical Investigation Program in the Sahtu Settlement Area - K'asho Gotine District
The 2007 Winter Field Geotechnical Investigation program in the Sahtu Settlement AreaK'ahsho Got'ine District (SSA-KG) was conducted between February 16 and March 18, 2007. The objective of this program was to gather information on the soil and ground conditions on or adjacent to a potential pipeline right-of-way in the Mackenzie Valley. This information is required in order to determine the availability of suitable granular materials for pipeline construction, to facilitate the design of pilings and foundations of structures and for the preparation of subsequent regulatory applications. Over the course of the program, information was collected from two borrow sources and one

infrastructure site.

Four boreholes were drilled and seven test pits were excavated at the two proposed borrow sources. Ten boreholes were drilled and five test pits were excavated at the infrastructure site.

Total expenditures for the program are approximately $3.12 million. Subcontracts accounted for approximately $2.34 million, CoItKBR labour about $782,000 and fuel and fixed wing aircraft were about $135,000. Over 10,000 hours were worked by the community monitors, subcontractors and CoItKBR personnel (49 people) without any medical or lost-time injuries.

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File No: 12 406 046 **Licence No:** 14121
Region: GW **Location:** At the site of the proposed Inuvik Area Facility (IAF) and along the route of the all-eather road connecting the IAF to the Dempster Highway

2007 Winter Field Geotechnical Investigation Program in the Gwich'in Settlement Area
The 2007 Winter Field Geotechnical Investigation Program in the Gwich'in Settlement Area (GSA) was conducted between March 20 and April 13, 2007. The objective of this program was to obtain information with respect to sub-surface conditions in the GSA at the site of the proposed Inuvik Area Facility (IAF) and along the route of the all-weather road connecting the IAF to the Dempster Highway. This information is required in order to design foundations of structures and roads and for the preparation of subsequent regulatory applications. Over the course of the program, information was collected from eight boreholes along the proposed all-weather access road and from 12 boreholes at the proposed IAF site.

The program began on March 22, 2007 with the surveying of the IAF access and continued with the drilling on the IAF site on March 28, 2007. Clean up of the Program area was completed on April 12, 2007 at the IAF access road. The Program was executed over 25 days.

Total expenditures for the program are approximately $2.66 million. Subcontracts accounted for approximately $1.74 million, CoItKBR labour about $883,000 and fuel for the drilling equipment was about $36,000. Over 9,960 hours were worked by the community monitors, subcontractors and CoItKBR personnel (57 people) without any medical or lost-time injuries. Pre-job safety meetings, occupational health and safety orientations and the weekly general safety meeting all contributed to the safe work record.

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Region: IN **Location:** Along the pipeline right-of-way in the Inuvialuit Settlement Region

2007 Winter Field Geophysical Investigation Program in the Inuvialuit Settlement Region
The objective of the program was to map areas along the right-of-way where the ground is unfrozen (taliks) and to locate ice wedges and larger, deeper areas of massive ice, in the Inuvialuit Settlement Region. Shallow geophysical surveys provided information on subsurface conditions. ARGO tracked vehicles towed geophysical instruments (EM31, Ohm Mapper, or GEM-2) behind them. A ground-penetrating radar survey, at two frequencies, was used to detect ice wedges and massive ice. A GPS unit was used to record the location of survey equipment. A soil conductivity survey was used to map unfrozen ground boundaries.

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File No: 12 406 048 **Licence No:** 14218
Region: IN **Location:** Near Inuvik and the general area of the proposed Parsons Lake development north pad location.

Proposed ConocoPhillips Canada (North) Limited Parsons Lake Gas Field Summer 2007 Access Research Program
Excellent visibility allowed for a very successful visual validation of the route terrain. No unique topographic conditions were identified and, therefore, no aircraft landings were required. Modern digital camera equipment was used to take pictures along the route and to document the specific locations previously identified as having slope grades exceeding 3%. The photographic images are date stamped and imprinted with the exact longitude and latitude GPS references. EISC flight guidelines were observed throughout the flight. No wildlife was seen during the entire research program. There were no safety incidents.

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Region: IN **Location:** Parsons Lake development area

ConocoPhillips Canada – Proposed Research Program Relating to Access Infrastructure for the Parsons Lake Natural Gas Development
The program's objective was to ground-truth, i.e. travel overland while collecting topographical information, future access infrastructure for proposed Parsons Lake natural gas field development.

Program scope was reduced by accessing the land for only one period of several days, rather than three times and by not placing weather stations. Only one route was accessed, the proposed winter road route from Tuktoyaktuk to the North Pad, approximately 78 km in length. Twenty-one lakes were examined to determine depth and ice thickness.

Data acquisition occurred March 18th to March 21st, 2007, mobilizing each day from Tuktoyaktuk. After the first day, the team was taken by helicopter to where the equipment had been left the day before. Although weather was a challenge at times, the program was completed safely, without incidents or spills.

Mackenzie Delta Integrated Oilfield Services Ltd., an Inuvialuit business, coordinated local contractors and equipment required for the program. The Tuktoyaktuk Hunters and Trappers Committee provided an environmental monitor and a wildlife monitor, who provided excellent guidance and support, helping to ensure safety for the team, wildlife and local heritage sites. The Inuvik Hunters and Trappers Committee also provided a team member whose knowledge and skills were valuable assets.

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File No: 12 406 047 **Licence No:** 14203
Region: IN **Location:** West Langley, East Unipkat, Arvoknar, North Langley, SE Ellice, Atik, West Olivier, Aput and South Langley.

MGM Energy Corp. 2007, 2008 and 2009 Summer Field Assessment and Advance Barge Project (the Project)
MGM Energy Corp. conducted biophysical investigations on proposed well and barge staging site location within their licensed exploration areas in the Mackenzie Delta region. The 2007 Summer Field Reconnaissance Program considered five potential well locations and nine potential barge landings sites. The locations examined are located on the outer western Mackenzie Delta, NWT, in the Langley and Ellice Islands area and on Reindeer and Arvoknar channels. All locations are west of the Kendall Island BirdSanctuary (KIBS). The program activities gathered baseline environmental information on vegetation communities, rare plants and wildlife habitat, sign and presence. Data acquired through the project will be used for: establishing baseline environmental conditions; and evaluating, selecting, and monitoring of previous, ongoing and potential future activities at these locations. The project team mobilized from Inuvik and conducted site visits at the selected locations via helicopter. Field methods include documenting the vegetation community, compiling a species list, recording incidental wildlife sightings, and ground searches to identify areas of high habitat suitability, based on vegetation types and terrain features. The overall results indicated that these areas are dominated by sedge and willow communities associated with the active fluvial sediments of the Mackenzie Delta. Two rare plant species were located and mitigation plans developed for each species. Whorled lousewort was found at one barge staging location along Arvoknar channel and arctic seashore willow was located at a potential Langley Island wellsite. Most surveyed areas were identified as important migratory bird breeding and staging habitat, but provide little terrestrial mammal habitat.

A brief reconnaissance level survey was also completed in the vicinity of the Ogruknang 2D seismic program approx. 50km north of Inuvik along the Caribou Hills and extending into Delta and riverine habitats. Observations included: typical Mackenzie Delta landscape with black spruce stands, tall willow shrubs,
birch and alder that are prominent along the many waterbodies, such as channels, creeks and lakes. No mammals were sighted during the over-flight, but several moose tracks (in the Delta) indicated the general presence of these ungulates. Many large flocks (on average 10 to 40 individuals) of ducks andseveral tundra swans were observed mainly in the Delta and to a lesser extent in the Caribou Hills.

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File No: 12 406 049 **Licence No:** 14227
Region: IN **Location:** Within the municipal boundaries of Tuktoyaktuk.

Wind Energy Monitoring in Tuktoyaktuk NWT
The objective of this wind monitoring program is to quantify the wind energy potential for the economic feasibility of building a wind farm in Tuktoyaktuk, a remote community that is dependant on diesel-electric generation. The most critical factor for further consideration of Tuktoyaktuk is identifying the best available wind turbine site and accurately assessing the wind at that site. The Hamlet of Tuktoyaktuk has had a wind monitoring tower in place since 2006. Preliminary results suggested that the wind energy potential in Tuktoyaktuk is marginal for wind development (Pinard, 2007); however, further monitoring is recommended. A new site has been identified for further wind resource assessment for possible wind development.

In September, 2007, the wind monitoring tower was moved to a new location within the municipal boundaries of Tuktoyaktuk. This new site was selected in consultation with the community of Tuktoyaktuk and was identified because it is more exposed to the prevailing winds and will likely experience higher average wind speeds that at the previous location. The equipment is currently maintained by a wind monitor in the community of Tuktoyaktuk who inspects the equipment monthly and downloads all of the wind data. After one full year of data collection, the data will be analyzed and a progress report will be completed.

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File No: 12 406 049 **Licence No:** 14243
Region: SA **Location:** Kee Scarp, which is located within the municipal boundary of Norman Wells and upon Commissioner's Land.

Wind Energy Monitoring in Norman Wells

No research was conducted under this research license. Work will be conducted in 2008 under a new research license application.

Health

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File No: 12 408 151 **Licence No:** 14264
Region: NS **Location:** Yellowknife (and outside the NWT)

Should Newborn Screening be Initiated in the Northwest Territories for Mild CPT1 (Carnitine Palmitoyl Transferase-1) Deficiency?
The 2006 newborn bloodspot cards for were and continue to be genotyped for the P479L variant of CPT1, which may cause mild CPT1 deficiency. This analysis is expected to be completed by early Fall 2008. Results from the analysis will be anonymous, and data for the territory will be reported back as total numbers.

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File No: 12 408 145 **Licence No:** 14171
Region: IN, GW **Location:** Municipal bounds of Aklavik

Dietary Choices in Aklavik: Youth and Elders Promoting Change
The Aklavik Health Committee partnered with the Arctic Health Research Network-Northwest Territories (AHRN-NT) and the local Moose Kerr School in May of 2006 to launch a Youth & Elders Dietary Choices Pilot Project, which was designed to engage Aklavik youth in examining dietary choices and diet-disease relationships at the community-level.

The first phase of the pilot project ran from May-July 2007 and was based out of Moose Kerr School with four senior students taking the lead in the project's development. As a community-driven participatory project, research facilitators worked in collaboration with the Aklavik Health Committee, Moose Kerr School, the Hamlet, local band office and other interested stakeholders to design the project and determine desired outcomes.

Phase one of the project took the form of an elective health class for senior students from Moose Kerr School. Completion of dietary recalls along with daily classroom discussions provided the students with a better understanding of their own eating habits and the opportunity to think critically about the implications and realities of dietary choices in their community. These activities motivated the students to create a video to capture other community members' perceptions about dietary choices and health. Two students from the class continued filming over the summer of 2007 and produced a 60-minute video documenting food and nutrition trends and challenges in Aklavik.

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Region: IN **Location:** Inuvik and Ulukhaktok.

Healthy Foods North Intervention Project
To achieve the overall goal of this program, which is to improve healthy food consumption through improved availability and nutrition education to prevent risk factors for chronic disease, the following activities as part of the initial phases were conducted in 2006:

The first phases of this program were:

- Training of local data collectors from Inuvik and Tuktoyaktuk, October, 2006;
- 24-hour food recalls were completed in the communities of Inuvik and Tuktoyaktuk. Men and women over 18 were selected randomly for the 24 hour food recall interviews. Local data collectors were trained to collect this information. A total of 101 dietary interviews were completed;
- Key stakeholders (elders, community leaders, health staff, store staff) from Inuvik and Tuktoyaktuk were interviewed regarding nutrition and food-related issues.

In 2007, information from these first phases was disseminated to the communities through community presentations and workshops in collaboration with our external contractors. Community workshops were used to determine foods for promotion, key behaviours, key messages and communications channels.

The results will be used to develop a comprehensive healthy eating community intervention program in six phases over three years, depending on the availability of funding.

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Region: IN,GW, NS **Location:** in Yellowknife and Inuvik.

Surveillance and Management of Climate Change Impacts in the North: Implications for Northern Public Health Policy: The Inuvialuit Case Study
Rapid environmental changes such as climate, weather and contaminants, have begun to disrupt the relationship between Northern Inuit populations and the ecosystem in which they live. Such disruptions in environmental integrity are predicted to have a negative impact on northern populations, particularly in the areas of human health and disease. In response, a baseline study was conducted in the Inuvialuit Settlement Region (ISR) to document and review the existing health surveillance and environmental monitoring network and activities in that region in order to identify existing challenges and strengths in the system and help design and implement pilot projects to address these issues in the future. Key informant interviews provided insight about present and emerging conditions that may be relevant to understanding surveillance and monitoring activities in the ISR. The manner in which surveillance data is collected, stored, analyzed and utilized is also discussed in order to identify strengths, gaps and priorities. The study highlights opportunities for improvement and collaboration as well as develops principles to guide strategies that support surveillance in an Inuit context. The case study also provides recommendations for data collection and analysis, knowledge translation, and dissemination of accurate information for early detection of environmental influences, including those related to climate change, on health.

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Region: IN. GW **Location:** Aklavik

The Aklavik *H. pylori* Project
The long-term objectives of this research are to develop a comprehensive approach to investigating community health problems related to *H. pylori* infection in NWT communities and to identify public health solutions that respond to community health care needs as perceived by community members and health authorities. As a starting point, a

project will be carried out in the Hamlet of Aklavik. 314 participants were recruited and 255 breath tests were preformed.

The prevalence of positive breath tests is 57%. This is a better reflection of the prevalence of *H. pylori* infection in Aklavik than the 72% positive by culture among those with biopsies from endoscopy. This is because residents who were informed of positive breath test results were motivated to undergo endoscopy, so proportionally more positives were in this group. The *H. pylori* prevalence of 57% is similar to what has been observed in other Inuit communities in Canada and Greenland. Preliminary antibiotic susceptibility testing results from 77 *H. pylori* isolates show the following proportion of strains resistant to specified antibiotics: metronidazole, 30%; clarithromycin, 8%; ciprofloxacin & nitrofurantoin, 1% each; amoxicillin, tetracycline & rifampicin, 0% each.

The community has been informed that treatment for those who are *H. pylori*-positive will be offered following the completion of antibiotic susceptibility testing of the isolated bacterial samples. This testing is currently expected to be completed by the end of September, 2008.

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Region: IN, GW **Location:** Aklavik and Holman

Changing the "Culture of Smoking": Community-Based Participatory Research to empower Inuvialuit communities
Work on this community-based participatory research (CBPR) project began in the two selected communities of Aklavik and Ulukhaktok in the fall of 2007.

The project is guided by a “National Team” which consists of three people from the Inuvialuit Settlement Region and four people from the south. Each community also has a “local CBPR team” consisting of specially selected and trained researchers/collaborators.

The initial orientation and training of the CBPR teams included information and discussions about tobacco and community-based research. National Team members then developed two detailed interview schedules/questionnaires: for adults and youth. Feedback on early drafts was taken up, a draft was pilot tested, and copies of the final research instruments were produced.

Unfortunately, due to many interruptions (community crises, illness, travel commitments, etc.), the CBPR teams were unable to collect baseline data before the summer of 2008. This will be tackled during the fall of 2008 instead. As a result of those delays, the team has no results to report at this stage.

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Region: IN, GW, SA, DC, NS, SS **Location:** Within twenty-three municipalities across the Northwest Territories

RHD Alleles in Prenatal Patients from Northern Canada
The RHD Allele Study is intended to learn more about the structure of the D antigen protein on the surface of red blood cells in aboriginal peoples of northern Canada. This protein has been studied in many populations around the world but not in northern Canadians. Routine blood samples from pregnant women who provide consent were used for the study. This was an important opportunity to learn more about the D antigen and to ensure that the laboratory testing procedures are optimal for this population. Knowledge of D is of value in selecting blood for transfusion and for management of pregnant women and their infants.

The study started in October 2007. To date 16 individuals have enrolled in the study. For valid results, over 50 participants are required. Letters have been sent to physicians caring for prenatal patients in the Northwest Territories

asking that they discuss the study with their patients who are of aboriginal origin. The red blood cells collected have been frozen and the genetic material has been extracted from each sample and stored for testing. Two samples have undergone preliminary molecular testing at the reference laboratory in Germany. Molecular analysis of the remaining samples will be done when sufficient additional samples are received.

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Region: NS **Location:** Yellowknife

Pain and Palliative Care with Seniors in Northern Canada
During the month of October 2007, focus groups and individual interviews were conducted with social service and health care practitioners and volunteers who work specifically with seniors receiving palliative care in the Yukon, the Northwest Territories and Nunavut. Individuals who were interviewed included, nurses, physicians, home care staff, social workers, First Nations Liaison staff, pharmacists, recreational therapists, hospice staff, and language interpreters. In addition, family members of seniors who were former palliative patients were also interviewed. Due to geographic restrictions, interviews were only conducted in each of the Territories' three capital cities – Whitehorse, Yellowknife, and Iqaluit. Participants were identified primarily through Health and Social Service agencies, as well as through word of mouth. In total, 53 individuals were interviewed for this research study.

The significant differences between each of the three Territories were evident in the results of this qualitative research study. The unique physical, social, cultural, and historical factors of each Territory have resulted in unique circumstances and services for seniors receiving palliative care support. Specifically, respondents discussed the importance of good communication, the importance of consistency in terms of both assessment and care provision, and the importance of acknowledging and respecting the impact of culture. There were also three unique themes that came out of the interviews conducted in the NWT and the Yukon Territory. These themes highlighted the following issues in regards to pain management and palliative care with seniors: the impact of former and current patient addictions on pain management; the impact of soul pain on pain management; and the recognition of alternative and traditional approaches to pain management.

This research study serves to highlight the importance of recognizing the differences and distinctions between regions, communities, and cultures. Each of Canada's three Northern Territories offers very different services to seniors in palliative care, and seniors from each Territory have their own distinct needs. Health and social service practitioners who work with seniors in palliative care must work to ensure that these differences are acknowledged and respected.

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Region: NS **Location:** Behchoko, Wekweeti, Gameti, and Whati

Tłı̨chǫ Natsedzi Nihtsi: Tłı̨chǫ Healing Wind Project/ Promoting Sexual Health
The purpose of this multi-year project is to reduce the incidence of Sexually Transmitted Infections (STI's) through the use of community relevant teaching methods and the promotion of healthy sexual practices. Goals include developing a baseline on how STI's are being contracted, developing a public awareness program on STI's and safe sex, training of healthcare givers, developing an information system to monitor STI cases, and reviewing the manner in which STI information in taught in school.

Plans for 2007 included training for community health workers in communicating sexual health issues, drafting a terminology list, implementing focus group workshops, and visits by HIV/Aids experts. The loss of community team members throughout the fall of 2008 caused the cancellation of the workshops in the communities and limited the number of activities. A Sexual Health workshop delivered by the Nechi Institute was delivered to Project team members from Behchokǫ̀ and Whatì, and a Tłı̨chǫ language terminology workshop was integrated with this work. New

and revised Tłı̨chǫ terms relating to healthy sexuality and STI's will be incorporated into the online Tłı̨chǫ dictionary. A speaker from the Canadian Aboriginal Aids Network provided workshops to secondary school students.

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Region: IN, GW, SA, NS, DC, SS **Location:** At NWT nursing stations and medical centres where CHNs are employed.

Community Health Nursing Study - Enablers and Barriers to Practice
The primary question for this research was: how do enablers and barriers for Community Health nurse to practice their full scope of skills and knowledge compare across sectors, geographical regions, sex and age?

The NHSRU CHN questionaire was mailed to over 12,000 Community Health Nurses across Canada. Data collection was completed in August, 2007. The overall response rate was 57%. Researchers are currently in the process of analyzing results and beginning to draft the report of findings. The final report will be available in June 2009.

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Region: IN, GW, SA, DC SS, NS **Location:** Public health organizations where Public Health Nurses are employed.

Building Community and Public Health Nursing Capacity
This study is the third part of a 3 project study that began in September 2006. Its overall goal is to investigate how community health nursing (CHN) services could be optimized.

The question for this project #3 was: "What are the organizational attributes that best support Public Health Nurses (PHNs) to practice to their full scope of knowledge and skills?"

Twenty-three separate focus groups of frontline PHNs and policy makers/managers were conducted in urban and rural areas of 6 geographic regions across Canada (British Columbia, Prairies, Ontario, Quebec, Atlantic, and the North). Data collection was completed in February 2008. Researchers are currently in the process of analyzing results and beginning to draft the report of findings. The final report will be available in June 2009.

Physical Science

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Region: IN **Location:** Oceanic region of the Mackenzie Shelf, Shelf Break, and Amundsen Gulf.

Circumpolar Flaw Lead (CFL) System Study - Part 1 (Ship-based research)
In the fall of 2007, the CFL Study used the CCGS Amundsen to conduct several open-water transects throughout the Amundsen Gulf and Southern Beaufort Sea. A total of 98 different researchers conducted research from the Amundsen for 74 days, totalling 2200 people-days. Thousands of water, air, ice and snow samples were taken to study many aspects of the Arctic ecosystem including fish, zooplankton, currents, nutrients, ice formation, contaminant transport and atmospheric processes. As a result of the record low amount of sea ice in the summer of 2007, the freeze-up period was delayed by approximately 2 weeks. When ice thickened in December, the ship entered a 'drift mode'. At this time, the ship parked itself within the ice allowing researchers to venture onto the ice and monitor the environmental conditions before the development of the flaw lead. When the piece of ice drifted outside of the main study area, the ship would be repositioned. From October 18 to December 31, a total of 80 open-water sites and 10 drift sites were sampled. During the fall period, the ship conducted community visits to both Paulatuk and Sachs Harbour. Several journalists also joined the ship to report on stories related to climate change in the Arctic.

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Region: IN **Location:** Specific locations of sites will be determined when the ice becomes landfast, and expected to be approximately 200 km from Inuvik

Ice rubble generation and its effects on EER systems and ice loading
Offshore structures placed in the Beaufort Sea can be protected from the moving ice cover if they are surrounded by broken ice, or ice rubble, that is grounded on the sea bottom. This reduces the ice loads and makes the structure safer and more environmentally secure. Thus, there is a clear advantage if a stable rubble field could be generated and maintained around the structure. The Canadian Hydraulics Centre of the National Research Council of Canada is investigating methods to passively generate this ice rubble. The research is being carried out through a review of past information on ice rubble fields in the Beaufort Sea, laboratory tests of the stability of ice rubble on sand and clay seabeds, cost-benefit analysis, and field measurements of grounded rubble in the Beaufort Sea. The field component in 2006-07 consisted of measurements of grounded rubble fields at several locations in the Canadian Beaufort Sea. Profiles of the rubble fields and the size of the ice blocks were measured. This was used to help to determine the stability of these rubble piles and to identity the factors that affect their stability.

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Region: GW, SA, DC **Location:** Near Norman Wells, Inuvik and Fort Simpson.

Recent changes in carbon source-sink relationships and greenhouse gas emissions in forest and peatland ecosystems along the Mackenzie Valley region of Canada

The Mackenzie Valley region of north western Canada has undergone the most warming (1.7ºC) over the last century in Canada. In light of such observed climate change, forest and peatland ecosystems in the Mackenzie Valley region are also likely changing. This IPY study is improving our understanding of the potential impacts of recent climate change, and associated disturbances, on vegetation distribution, carbon (C) storage and accumulation rates, greenhouse gas (GHG) dynamics, as well as C source/sink relationships in forest and peatland ecosystems along the Mackenzie Valley region. As part of the study, the information being collected will be used to develop a model of C storage and dynamics in order to predict future impacts of climate change, and disturbances in northern forest and peatland ecosystems. It is important to study these northern forest and peatland systems because of the pivotal role they play in the global C cycle, either removing/emitting GHGs from/to the atmosphere in response to climate changes.

During May 2007, intensive monitoring sites were established throughout the Mackenzie Valley and northern Alberta, with locations in the regions of Inuvik, Norman Wells, Fort Simpson, and Fort McMurray. Measurements on these sites include, over-storey, understorey and ground layer species composition and biomass, active layer depth, canopy closure, lichen biomass measurements and soil as well as water measurements. Carbon dioxide and methane (CH_4) measurements were initialized in September and repeated in October 2007. Instruments are being installed to continuously monitor water table depth, soil moisture, soil temperature, water chemistry, redox and oxygen concentration, in order to relate the environmental variables with GHG measurements. Early results shows that surface respiration rates decreased with increases in latitude of the sites and decreased with mean annual temperatures. Methane production was measured in the submerged parts of the soil profile, though there are not sufficient data yet to assess the climatic variables that drive CH_4 production. Initial observations, however, illustrate that CH_4 concentrations rapidly increase below the water table level in regions of permafrost thaw. The results from the modeling and mapping exercise suggest that the permafrost distribution pattern within the study area is very intricate and varies with local microclimate and hydrology, including depth-to-water from the soil surface and corresponding vegetation cover. These model simulation results correlate well with image analysis of aerial photographs.

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Region: IN **Location:** Canadian Beaufort continental shelf, bounded by 131°00' to 141°00' West longitude and 69°30' to 71°00' North latitude.

Beaufort Shelf Seabed Mapping Project

In August-September 2007 the Geological Survey of Canada in collaboration with the Canadian Hydrographic Service conducted a seabed mapping program from the Canadian Coast Guard vessel NAHIDIK. Research was focused on investigating geohazard and geoenvironmental constraints to offshore hydrocarbon development and transportation. Two new extreme ice scours were mapped in 2007 bringing the total to only 268 events with depths greater than 2m over 17 years of repetitive mapping. Two high school students from Tuktoyaktuk participated in the sediment sampling of extreme ice scour events to determine the impact of ice keels on the seabed. Pingo-like-features mapped on the eastern shelf are characterized by well defined mud flows suggesting these features may be mud volcanoes similar to those mapped on the western shelf in the past. The abandoned artificial island, Minuk in 14m water depth, first surveyed in 2003 was resurveyed in 2007. The island is still actively eroding and has migrated 10m southeastward in the elapsed 4 years. The new digital multichannel reflection seismic system showed the top of subsea ice-bearing permafrost to have a very variable topography. As in previous years bowhead whale marks

continue to be observed on the seabed. Sightings of bowhead whales off Cape Dalhousie resulted in the vessel being redirected to a new survey area by the marine mammal monitor on board.

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File No: 12 404 325 **Licence No:** 14220
Region: IN **Location:** At and near Paulatuk, Garry Island, Illisarvik (Richards Island) and Inuvik.

Permafrost Investigations and Climate Change, Western Arctic Canada
In 2007, the researchers concentrated their research in the western Arctic on obtaining ground temperatures from permafrost that show the impact of recent climate warming on the ground. They obtained ground temperatures from Herschel Island which indicate warming of the permafrost there by about 1.3°C since 1970. These measurements were from depths to 42 m. They have analysed these measurements and have shown that the ground warming is a result of climate warming throughout the 20th century. We have determined that increases in snow depth may add another 2°C to the ground warming, especially as vegetation on Herschel increases in height.

In 2006, the researchers installed a ground temperature cable to a depth of 50 m in the tundra at the Illisarvik experimental research reserve. Data collected in summer 2007 suggest that the ground has warmed by about 1.5°C since 1970.

The researchers also installed a cable to 15 m depth near Paulatuk. They were hoping to drill to 40 m, but the drill broke at 15 m and must redrill the site in 2008. They have had some data collected from this cable in 2007 and it appears that the ground temperature near Paulatuk is about -6°C.

At the moment Chris Burn has nearly completed two reports on the research at Herschel Island. In addition, he is collaborating with Steve Kokelj (DIAND) to produce a set of reports about recent permafrost research in the Mackenzie delta area. There are about 10 papers in this collection. They hope to produce both a research volume and a plain-language text, which will be of use to people in the delta area.

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Region: IN **Location:** Mallik site, Richards Island

2006-2008 JOGMEC-NRCan Mallik Gas Hydrate Research and Development Project
The 2006-08 Mallik gas hydrate production research program was being conducted to evaluate the natural properties of gas hydrates, and for the first time to measure and monitor their long-term production behavior. Results from the short-duration production test completed in 2007 confirmed a vigorous reservoir response to stimulation by depressurization, with increasing gas flow during the testing period. However, the 2007 production test encountered operational problems due to sand and water flow into the well which limited its duration. Measures were taken in 2008 to overcome these problems and the testing proceeded without interruption. Continuous gas flow was observed in response to depressurization with rates ranging from 2000 to 4000 m^3/day throughout the course of the six-day (139-hour) test. Cumulative gas production volume was approximately 13,000 m^3. Detailed analysis of the results are ongoing, but initial data confirm that the depressurization method is technically viable and the project participants feel that proof of concept has been demonstrated.

Gas hydrates are thought to represent a vast potential energy resource for Canada with concentrated deposits known to occur in the Mackenzie-Beaufort area and the Arctic Islands. The research and development studies being undertaken by Japan Oil, Gas and Metals National Corporation (JOGMEC), Natural Resources Canada (NRCan), ARI at Mallik are designed to address gaps in understanding of the properties of gas hydrates, document the production response and assess the utility of conventional production technologies. Scientific and engineering results from the program will be made to available to scientists, regulators and northern stake holders through the release of publicly available reports and data bases.

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File No: 12 404 683 **Licence No:** 14229
Region: DC **Location:** Glaciers and their forelands above the Brintnell and Bologna Creeks, Glacier Lake and, in particular, the Brintnell-Bolgna Icefield

Secular Change in the Glacier Cover Contributing Flow to a World Heritage River - Ragged Ranges, South Nahanni River
The objectives of this research are to document the glaciers in the Ragged Range, how they have changed in the past and what their role is presently in providing meltwater for the upper reaches of the South Nahanni River and the Flat River. Glaciers nourish streams and groundwater when other sources are absent or in decline (e.g., snowmelt, precipitation). They are most important late in the summer season, when snowcover is largely absent and in association with warm, dry weather.

Glaciers also provide eco-system services for species that are highly adapted to cold water temperatures, and stable water levels for reproduction, rearing and migration. Extreme flows can also be produced where the presence of glaciers augments river flow during protracted rain on ice events. These higher flows can create beneficial refugia but also may have negative impacts on sedimentation rates and the stability of the river course. The presence of snow and glacier cover also assists in driving “katabatic” wind flows in mountain valleys – sought out by caribou and other mammals as relief from insects.

During the 2007 glaciological year, project participants measured elevation, ice flow and mass balance changes for the northern sector of the Brintnell-Bologna Creek Icefield. This represents the first ever glacier mass balance data collected for this region. The “mass balance” is a measurement of how much mass is added in Winter and how much is lost in the Summer due to melting of the surface. The difference is the “net” mass balance and depends on both Winter and Summer weather. When a glacier has a many years in a row of negative net mass balance, it will begin to retreat. How many depends on the size and geometry of the glacier.

The data is now being analyzed and compared to past changes determined from the interpretation of remote sensing images. Many images stacked together provide a time series of the historical glacier boundaries, including the position of moraines. The moraines are dated using the size of lichens that started growing on the carbonaceous rocks that were uncovered as the glacier receded.

Hydrological and climate data is also being gathered in order to better characterize the regions hydro-climatic variability. Given, the sparse information available on river flows high in the South Nahanni River headwaters, a water and carbon isotope hydrology survey is currently being planned. The proportional abundance of the different isotopes allows an estimation of where the water in the stream originates – whether from old or newer groundwater, snow and ice melt or rainfall.

Collectively, this research will assist in evaluating the eco-system services provided by glaciers and provide baseline data upon which to monitor and evaluate the ecosystem integrity of the regions’ freshwater systems.

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Region: DC **Location:** Deh Cho region, between 60N and 62N and 119W to 121W.

Surficial geology of Mackenzie Corridor
The southern Mackenzie Mountains region has a complex glacial history within the Canadian Cordillera, reflecting its situation along the point of coalescence between the Laurentide (continental/eastern-derived) Ice Sheet and the Cordilleran (montane/western-derived) Ice Sheet and local montane ice caps. Stratigraphic and geomorphic evidence indicates that Laurentide ice advanced west and northwest over the foothills and up major valleys after approximately

52 ka BP (C-14 ages) but before 29 ka BP (Cl-36 ages). Several ages from pre-glacial alluvial deposits underneath Laurentide till were obtained in exposures of Dahadinni and Ochre rivers. These ages have yielded several uncalibrated radiocarbon dates bracketing between 52.2 ka BP to 45.43 ka BP. Coalescing montane and Laurentide ice sheets led to buttressing and thickening of the regional ice cover such that near the north-south divide, it eventually overtopped the highest summits at 1820 m above sea level. Large ice-dammed lakes formed in valleys such as the South Nahanni River, and Canadian Shield-derived granite erratics, deposited by Laurentide ice, have been found over 150 km west of the mountain front. Laurentide ice was the first to retreat, whereupon stratigraphic evidence indicates that Cordilleran and montane ice advanced short distances eastward overtopping continental glacial deposits. Ice-dammed lakes once again re-formed in valleys between the retreating ice masses. This pattern of glaciation is similarly reflected in late Pleistocene stratigraphic records from the northern Mackenzie Mountains. The Late Pleistocene glaciation caused a number of major changes to the landscape of the southern Mackenzie Mountains and Mackenzie River region. At some point, glaciers blocked and diverted the Redstone River. In pre-glacial time, the Redstone River had drained eastward across the Franklin Mountains, of which there is a discernible geomorphic signature superimposed upon the Paleocene uplift of the region including meanders of former tributaries within intermontane valleys. Glacial diversion of the Redstone River occurred around by 9.2 ka BP (age obtained from a silt-clay-sand bed under 22 m of till) indicating the presence of Laurentide ice nearby blocking the river giving a late age for the presence of the continental ice in the corridor. The channel incised through a highly folded and faulted terrain, triggering extensive landsliding that continues today. Several other changes occurred in the drainage such as: lower Root River and North Nahanni River including: unusual surficial geology from indications of the first Laurentide till preserved in stratigraphic sections; major drainage diversions glacial outburst floods. Recognizing the pressing need for geoscience data in light of the proposed Mackenzie Valley Gas Pipeline, the researchers have not only undertaken a wide diversity of studies, but also the manner and formats in which this data is being published.

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Region: IN **Location:** Mackenzie Middle and Outer Delta lakes

Links between permafrost stability and terrestrial organic carbon export from the Mackenzie River
One predicted major consequence of the global warming trend is rapid destabilization of the extensive permafrost soils that occur on the continents surrounding the Arctic Ocean. These permafrost soils contain approximately half of the carbon stored in soils globally, and lie in the watersheds of numerous rivers on the Eurasian and North American continents that drain into the Arctic Ocean. Degradation of permafrost is thus predicted to result in an abrupt release of the carbon stored in this vast soil reservoir to the oceans and atmosphere. In order to establish whether this process is already underway, and to provide a context for potential future change, it is important to assess past carbon discharge by Arctic rivers.

In April 2007, sediment cores were collected from lakes within the Mackenzie Delta. These lakes receive water and sediment during the spring thaw when the river breaches its banks and inundates the delta. In this way, fresh sediment is deposited each year and sediment cores taken in the lakes can provide a time history of sediment and carbon discharge by the river. The science party consisted of co-principal investigators Tim Eglinton and Liviu Giosan, Research Associate Daniel Montluçon, and postdoc Angela Dickens. In addition, two members of the local Inuit population participated as wildlife and environmental observers. The field program was staged from the Aurora Research Institute and efforts were focused on two lakes in the delta that differ in terms of the proximity to the main river channel and frequency with which they flood. Up to 6m-long cores were successfully recovered, providing a record of past carbon export by the river that may extend back over 500 years.

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File No: 12 404 141 **Licence No:** 14167
Region: IN **Location:** Several coastal sites on Prince Patrick Island and eastern Banks Island

Environmental Change in the Western Canadian Arctic Islands
Two related field projects were conducted on Banks Island and Prince Patrick Island from June 30 to July 28, 2007. These studies principally involved two Ph.D. candidates (Tom Lakeman and Roy Coulthard) from the University of Alberta supervised by Dr. John England. One study (Lakeman) was based on the east coast of Banks Island with camps at Johnson Point (June 30 to July 14) and Stewart Point (July 14 to 28). The second (Coulthard) was situated on the west coast of Prince Patrick Island with camps at Bloxsome Bay (June 30 to July 18) and Mould Bay (July 18 to 27). Both studies surveyed glacial landforms and raised marine sediments to constrain the history of glaciation and relative sea level change in the western Canadian Arctic. Several samples of fossil molluscs and driftwood were collected from the deposits and are in preparation for radiocarbon dating. In addition, rock samples are being analyzed for cosmogenic exposure age dating and U-Pb zircon dating. These data will enable a reconstruction of past environmental variability, which will place modern changes in an accurate temporal context, thus making it possible to discern the significance of future climatic and environmental changes in the Arctic.

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Region: NS **Location:** In the vicinity of the Daring Lake Tundra Ecosystem Research Station

Assessing snowpack water equivalent distribution in the Exeter-Yamba-Daring Lake catchment, Coppermine River Basin, NWT for passive microwave algorithm development and stable isotope analysis
During the April 2007 field campaign, surface and satellite based passive microwave datasets were acquired along with spatially and temporally correspondent in-situ snow cover measurements. A suite of Environment Canada's ground radiometers were deployed in the vicinity of the Daring Lake research camp. The very high resolution (2 m) ground based data was very useful for examining how sub-grid features effect course resolution satellite measurements. Detailed ground measurements of snow cover properties were acquired in conjunction with the ground based radiometers at fixed sites and along transects. Other snow data were acquired at sampling sites chosen based on previous years sampling locations.

Preliminary results of snow cover data analysis from the 2003 through 2007 field seasons were presented at the 64th Eastern Snow Conference in St. John's Newfoundland in June of 2007. Topography and wind velocity were shown to have a strong control on snow deposition in a tundra environment. Regionally uniform landscapes, such as, lakes and flat tundra were found to have the least variable snow cover properties. Sites located on slopes were consistently the most variable. The ratio of SWE on flat tundra to other landscape types was shown to be useful for characterizing inter-annual similarities. Results of on-going analysis on multi-scale airborne and ground based passive microwave data, collected in 2005 and 2007, were presented at the IEEE IGARSS Conference in Barcelona Spain in July 2007. It was shown to be possible to estimate SWE over homogenous flat tundra with high resolution sensors (2 m and 50 m). However, over lakes, deep snowpacks and when larger heterogeneous pixels are considered, the ability to estimate SWE breaks down and there is a significant underestimation of actual SWE. The analysis of these multi-scale data has been critical for developing improved algorithms that consider lake area, complex terrain and regional scale heterogeneous pixels.

Results and research findings were also communicated a two day workshop (February 19-20) hosted by The Department of Environment and Natural Resources, GNWT in Yellowknife. The workshop gave us the opportunity to provide a presentation of our research to other northern scientists and community members. We also had the opportunity to present at a public information session with Ecology North group. This was a good opportunity to interact directly with the public and inform them of our research objectives and findings. The also attended the Science in the Changing North conference which was held April 24 and 25 in Yellowknife. The conference gave them further opportunity to present their research and findings to other researchers and community members.

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File No: 12 404 593 **Licence No:** 14204
Region: GW, SA **Location:** At the region of the upper Ramparts River and upper Arctic Red & Bonnet Plume Rivers.

Regional Geochemistry Survey, Mackenzie Mountains NWT
A regional stream sediment survey was carried out in the northern MacKenzie Mountains area at a density of one sample per 13 km^2. Heavy mineral samples were collected at a density of one sample per 25 km^2. The survey covers (parts of) NTS map sheets 106G (Upper Ramparts), 106B (Bonnet Plume), and 106C (Nadaleen Lake). The project will provide geochemical baseline data for a large area as well as identify mineral potential and natural geochemical 'hazards.'

At all sites a stream sediment (fine sand, silt and clays) as well as a water sample was collected. At strategic locations in each drainage basin bulk sediments were collected as well. A high energy location in the stream is targeted and on site part of a gravel bar will be manually sieved through a screen to concentrate the heavier sand fraction material. At a typical site 12-14 kg of material was collected. This material will be shipped to a mineralogical lab and Kimberlite Indicator Minerals as well as other heavy minerals will be determined. This will narrow the search criteria for mineral deposits and help in the evaluation of the mineral potential of the survey area.

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File No: 12 404 652 **Licence No:** 14202
Region: IN **Location:** Mackenzie Shelf and Amundsen Gulf, Beaufort Sea.

ArcticNet theme 1: Intergrated Regional Impact Study of the Coastal Western Canadian Arctic
For a fourth consecutive year, the Canadian research icebreaker CCGS Amundsen traveled north for ArcticNet's annual expedition to the coastal Canadian Arctic. Since 2004, ArcticNet has established long-term marine observatories in the western Arctic, northern Baffin Bay, Hudson Bay and Laptev Sea (Russia). Each observatory consists of a number of moorings all equipped with instruments that gather continuous records of currents, temperature, salinity, turbidity, dissolved oxygen and the vertical flux of carbon and contaminants. As the climate of the northern Hemisphere is poised to tip into a new equilibrium, there is an urgent need to determine the relative importance of atmospheric and oceanic forcing in the continuing warming of the Arctic Ocean. While satellites provide a good spatial coverage of lower atmosphere temperatures, the annual monitoring of ocean heat fluxes can only be obtained at fixed points using moored instruments. A main objective of the 2007 expedition onboard the CCGS Amundsen was to service and redeploy the Hudson Bay, northern Baffin Bay and western Arctic moorings in an effort to maintain a network of long-term marine observatories for monitoring present variability and forecasting future changes in the coastal Arctic Ocean.

The 2007 ArcticNet expedition was divided into two legs. During the first leg of the expedition (July 26 to August 17), the Amundsen traveled from Quebec City, QC to Churchill, MB and carried out sampling operations at designated stations in northern Labrador and Hudson Bay. All Hudson Bay moorings were serviced and redeployed for another year.

The second Leg of the ArcticNet 2007 expedition started in Resolute Bay on September 27. From Resolute Bay, the Amundsen headed straight for northern Baffin Bay to service the 2 moorings deployed in 2006 and to deploy an additional mooring. Because of difficult ice conditions, the two moorings could not be retrieved and had to be left submerged for another year. The deployment of any additional moorings in northern Baffin Bay was also postponed to 2008. Besides operations conducted at the mooring stations, shipboard sampling was carried out along the ship track and at specific sampling stations located throughout northern Baffin Bay, the Northwest Passage and Amundsen Gulf. Operations included bottom mapping, meteorological measurements and the sampling of seawater, sea ice, bottom sediments, plankton and larval fish. The quantity of organisms sampled was ecologically insignificant.

The ArcticNet 2007 expedition ended when the Amundsen reached Sachs Harbour, NT on October 18 after servicing a number of moorings in the Beaufort Sea. In total, over 100 ArcticNet researchers, students and technicians from nine Canadian universities and four federal departments (Fisheries and Oceans, Environment, Natural Resources, Parks) were involved in the 2007 expedition.

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File No: 12 404 665 **Licence No:** 14132
Region: DC **Location:** Proposed pipeline corridor, infrasturcture sites, access roads to planned facilities and other areas

2006 – 2007 Biophysical and Reconnaissance Studies in the Deh Cho Region
The 2007 biophysical and reconnaissance studies in the Deh Cho Region included taking stream temperature measurements and conducting thermistor indicator data recovery, geo-hazard reconnaissance and an airborne geophysical study. All activities complied with licence conditions. The studies were conducted by crews of up to four individuals, including a local assistant, using helicopters. The program took 15 days to complete, between June 22 and September 17, 2007.

The stream tempurature program consisted of installing six stream temperature data loggers in three watercourses along the proposed Mackenzie Valley pipeline corridor in June 2007. The data loggers collected in-stream temperatures throughout the summer, and in September 2007, a team returned to recover the data loggers in one of the streams. The data loggers were left in-stream at two watercourses.

Data from thermistor strings installed during previous programs was also collected at one site. Reflective tape was added to visited thermistor locations to improve thermistor casing visibility. An airborne electromagnetic survey of the proposed Mackenzie Valley pipeline right-of-way was conducted. The purpose of this survey was to identify frozen and unfrozen soils, and to determine the frequency and spacing between discontinuous permafrost zones. The survey covered 1,220 km of proposed right-of-way from the tree line (25 km north of the Inuvik area facility) south to the Alberta boundary. The survey was conducted by helicopter, flying at low level over the proposed right-of-way, over a 25-day period.

The objective of geohazard reconnaissance was to more accurately map the features previously identified by aerial photography and LiDAR. The main field activity was to refine potential pipeline routes by helicopter flights and extensive ground truthing of surface terrain types. This activity was carried out along the length of the proposed Mackenzie Valley pipeline.

The information collected by this research was used to refine proposed pipeline routing designs and improve construction plans. The information will also be included in the regulatory applications (to the National Energy Board and northern boards) for the Mackenzie Gas Project.

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Region: GW **Location:** Proposed pipeline corridor, infrasturcture sites, access roads to planned facilities and other areas

2006 - 2007 Biophysical and Reconnaissance Studies in the Gwich'in Settlement Area
The 2007 biophysical and reconnaissance studies in the Gwich'in Settlement Area included: taking stream temperature measurements and conducting regulatory site inspections, thermistor data recovery, aquatics (fish) studies, bathymetry studies, barge landing access road reconnaissance and an airborne geophysical study. All activities complied with licence conditions. The studies were conducted by crews of up to six individuals, including a local assistant, using helicopters and, in some cases, boats. The program took 27 days to complete, between June 18th and October 14th, 2007.

The stream temperature measurements program consisted of installing four stream temperature data loggers in two watercourses along the proposed Mackenzie Valley pipeline corridor in June 2007. The data loggers collected in-stream temperatures throughout the summer, and in September 2007, a team returned to recover the data loggers.

Data from thermistor strings installed during previous programs was collected at 14 sites. Reflective tape was added to visited thermistor locations to improve thermistor casing visibility.

An assessment of the potential impact on fish and fish habitat was conducted at proposed barge landing sites and watercourse crossings. The fishing work was also licensed by Fisheries and Oceans Canada, and was carried out using both helicopters and boats over a three-day period.

A ground-based assessment was conducted of the suitability and alignment of the proposed all-season access road for transporting the very large modules from two potential Inuvik South barge landing sites to a storage area near the Dempster Highway. The work consisted of:

- surveying the barge landing and road access area;
- conducting a surface inspection of areas of potential concern.

A similar assessment of the proposed winter access road for transporting the very large modules from the storage area to the Inuvik area facility was also conducted, consisting of a surface inspection of areas of potential concern.

A detailed bathymetric survey was conducted on 45 km of river channels, including the East Channel, Oniak Channel and Luker Channel from about 3 km south of the Town of Inuvik down to the confluence of Luker Channel and Middle Channel. Sub-bottom surveying was conducted at 19 narrow watercourse areas and sediment samples were taken at 16 sites and analyzed to assess the potential need for dredging. The team also conducted a detailed bathymetry study, sub-bottom profiling and sediment sampling in the region known as the Kittigazuit S Bends.

The information collected by this research was used to refine proposed pipeline routing designs and improve construction plans. The information will also be included in the regulatory applications (to the National Energy Board and northern boards) for the Mackenzie Gas Project.

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File No: 12 404 665 **Licence No:** 14134
Region: IN **Location:** Taglu anchor field, proposed pipeline corridors, infrasturcture sites, access roads to planned facilities and other areas

2006 -2007 Biophysical and Reconnaissance Studies in the Inuvialuit Settlement Region
The 2007 biophysical and reconnaissance studies in the Inuvialuit Settlement Region included taking stream temperature measurements and conducting thermistor indicator data recovery, aquatics (fish) studies, bathymetry studies and geo-hazard reconnaissance. All activities complied with licence conditions. The studies were conducted by crews of up to seven individuals, including a local assistant, using helicopters and, in some cases, boats. The program took 35 calendar days to complete, between June 19th and September 12th, 2007.

The stream temperature measurement program consisted of installing six stream temperature data loggers in three watercourses along the proposed Mackenzie Valley pipeline corridor in June 2007. The data loggers collected in-stream temperatures throughout the summer, and in September 2007, a team returned to recover the data loggers.

Ground temperature data from thermistor strings installed during previous programs was collected at 16 sites. Reflective tape was added to visited thermistor locations to improve thermistor casing visibility.

An assessment of the potential impact on fish and fish habitat was conducted at potential barge landing sites and on the barge transport route proposed for transporting the very large modules that would be used for the gas conditioning facility near Inuvik (the Inuvik area facility). The areas investigated included the
Yaya River and a barge landing site south of Inuvik. The fishing work was also licensed by Fisheries and Oceans Canada, and was carried out using both helicopters and boats over a nine-day period.
The information was collected through:

- fish capture studies to determine the relative abundance, distribution and movement of fish species present in the East Channel during the probable periods of proposed dredging;

- fish and fish habitat studies at proposed barge landing sites near in Inuvik and at Yaya River. Studies included sediment and benthic invertebrate sampling.

A detailed bathymetric survey was conducted on 45 km of river channels, including the East Channel, Oniak Channel and Luker Channel, from about 3 km south of the Town of Inuvik down to the confluence of Luker Channel and Middle Channel. Sub-bottom surveying was conducted at 19 narrow watercourse areas, and sediment samples were taken at 16 sites and analyzed to assess the potential need for dredging. A detailed bathymetry study, sub-bottom profiling and sediment sampling were conducted in the region known as the Kittigazuit S Bends. This study was carried out using boats over a 27-day period.

The information collected by this research was used to refine proposed pipeline routing designs and improve construction plans. The information will also be included in the regulatory applications (to the National Energy Board and northern boards) for the Mackenzie Gas Project.

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File No: 12 404 665 **Licence No:** 14148
Region: SA **Location:** Proposed pipeline corridor, infrasturcture sites, access roads to planned facilities and other areas

2006-2007 Biophysical and Reconnaissance Studies in the Sahtu Settlement Area
The 2007 biophysical and reconnaissance studies in the Sahtu Settlement Area included: taking stream temperature measurements, conducting regulatory site inspections, assessing thermistor and slope insulation, and conducting indicator data recovery, geo-hazard reconnaissance and an airborne geophysical study. All activities complied with licence conditions. The studies were conducted by crews of up to four individuals, including a local assistant, using helicopters and, in some cases, boats. The program took 22 days to complete, between June 20th and September 10th, 2007.

The stream temperature measurement program consisted of installing 12 stream temperature data loggers in six watercourses along the proposed Mackenzie Valley pipeline corridor in June 2007. The data loggers collected in-stream temperatures throughout the summer and in September 2007, a team returned to recover the data loggers.

Data from thermistor strings installed during previous programs was collected at 21 sites. Reflective tape was added to visited thermistor locations to improve thermistor casing visibility.

A slope insulation study site had been established near Norman Wells in the spring of 2006. This site was revisited to collect data used to assess the effectiveness of using flax straw bales and a reflective surface as potential techniques to reduce thermal degradation on slopes in ice-rich soils. As well, slope indicator measurements at the Saline River were taken to measure slopeinclination.

An assessment of the potential impact on fish and fish habitat was conducted at the Little Chicago barge landing site. The fishing work was licensed by Fisheries and Oceans Canada and was carried out with both helicopters and boats over a two-day period.
The information was collected through:

- fish capture studies to determine the relative abundance, distribution and movement of fish species present in the East Channel during the proposed periods of dredging;
- fish and fish habitat studies at the proposed Little Chicago barge landing site;
- fish and fish habitat studies, including sediment and benthic invertebrate sampling, at the proposed Little Chicago dredging sites.

The information collected by this research was used to refine proposed pipeline routing designs and improve construction plans. The information will also be included in the regulatory applications (to the National Energy Board and northern boards) for the Mackenzie Gas Project.

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File No: 12 404 619 **Licence No:** 14099
Region: DC **Location:** Along the Hay River from Enterprise to the Town of Hay River

Hay River Ice Jam Study
The 2007 field research program brought members from the University of Alberta, and the Department of Indian Affairs and Northern Development (DIAND) to the Town of Hay River to observe, measure, and document breakup (April 19 to 28). A significant amount of water and ice moved mainly into the West channel, resulting in flooding and an evacuation on Vale Island. The researchers measured water levels at key sites, and photographed the river breakup progression both from the ground and small airplane. Chief Alec Sunrise of the Katl'odeeche First Nation (KFN) accompanied us on one of the flights; Mr. Red McBryan of the Flood Watch Committee joined us on two flights.

In the summer (July 17 to 19 and July 23 to 27) the researchers completed a bathymetric survey of the river channel. Using a GPS and a specialized survey boat, the topography above and below the water surface was mapped, including flood prone areas of Hay River's Old Town and airport runway. The reserachers also used an acoustic system to measure streamflow in the delta channels.

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File No: 12 404 677 **Licence No:** 14190
Region: NS, SS **Location:** Near the Tyhee's Yellowknife Gold Project (within these co-ordinates: 63° 13' 59.76" N - 13° 45' 00" W and 63° 14' 59.87" N - 113° 46' 59.88" W).

Tyhee Hydrology and Meteorology Data Collection Project
Tyhee NWT Corp. is conducting baseline environmental studies on its Yellowknife Gold Project site as part of the development of a gold mine in the area. Only a single field survey was conducted during 2007. This was required for servicing of the Parshall flumes initially installed on the outlets of Narrow, Winter and Round lakes during the summer of 2005.

The period of record for the 2007 Narrow Lake hydrology survey was from May 21 to September 28, 2007. The maximum measured outlet discharge of 132.3 L/s occurred on May 21, 2007. The average measured daily total discharge from only the Narrow Lake basin for 2007 was 1132 m3/day. The Narrow Lake basin runoff for 2007 was 38.7 mm. The Winter Lake Hydrology survey period of record was from May 19 to September 28, 2007. The maximum recorded outlet discharge was 64.2 L/s and occurred on May 25, 2007. The measured average daily discharge for the Winter Lake basin for the summer of 2007 was 1005 m3/day. In 2007 the Winter Lake basin runoff was 30.4 mm. The period of record for the 2007 Round Lake hydrology survey was from May 19 to September 28, 2007. The maximum measured outlet discharge of 11.9 L/s occurred on June 1, 2007. The average daily total discharge for the summer of 2007 was 188 m3/day. For 2007 the Round Lake basin runoff was 20.4 mm. The Nicholas Lake hydrology survey period of record was from June 5 to September 30, 2007. The maximum recorded outlet discharge was 11.9 L/s and occurred on May 31, 2007. The minimum recorded discharge was 0.0 L/s on July 4, 2007. The measured average daily discharge for the Nicholas Lake basin for the summer of 2007 was 1056 m3/day. In 2007 the Nicholas Lake basin runoff was 18.8 mm.

The objective of the meteorological component of the study was to continuously record weather conditions at the Tyhee property site. The meteorological station installed on September 28, 2004 continuously recorded meteorological parameters for 2007. These parameters are wind speed and direction, air temperature, relative humidity, solar incident radiation and precipitation. Typical maximum daily wind gusts were in the range of 6 to 10 m/s, however; wind gust speeds near 16.0 m/s were recorded. Air temperatures at camp are typically 10 to 25 ºC during the summer with a maximum recorded temperature of 27ºC on June 28, 2007. Typical winter temperatures range from -5 to -40ºC and the lowest recorded temperature for 2007 was -41.9ºC which occurred on January 13, 2007. On site barometric pressures converted to equivalent sea level pressure is typically 1012 hPa but can vary as

high as 1042 to as low as 976 hPa. Relative humidity is typically near 90%, but frequently it can drop to as low as 30% for periods of up to a day. Peak solar incident radiation during the summer is in the vicinity of 900 W/m2. However, during the winter period (December to January) the radiation is near 50 W/m2. The total precipitation recorded for 2007 was 130.0 mm but this is only for a 9.2 month period in 2007 as the precipitation gauge was not functioning over the period from January 1 to March 22, 2007.

Evaporation rates determined at the meteorological station by means of an evaporation pan were 4.1 mm/day, with a total of 431.4 mm over the period of record from June 3 to September 15, 2007. The estimated lake evaporation rate determined using a factor of 0.7 was 2.9 mm/day with a total evaporation of 302 mm for the period of record.

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File No: 12 404 554 **Licence No:** 14169
Region: NS **Location:** In the area located between Gameti and Chartrand Lake (115^{o}30'W and 64^{o}30'N)

Southern Bear Province Geological Mapping Project
The Southern Bear Geological (bedrock) Mapping Project is ~240 km north of the city of Yellowknife, NT and covers NTS map sheets 085B/4 and 5 and 086C/1-8. The 2007 field season, which was the fourth and final for the project, got underway on July 5th and ended on August 24th. Field mapping was completed with a two-person team consisting of V. Jackson and a Master's student from University of Alberta. They operated out of 4 base camps located on Ingray Lake, Margaret Lake, DeVries Lake, and Lac Ste Croix. The main aim of the season was to complete mapping and examine critical relationships identified in previous seasons. A helicopter was used for six days out of the Lac Ste Croix camp. Two days at the end of August were spent working out of Gameti.

Rocks within the project area can be subdivided according to age: Archean rocks, which are older than 2.5 billion years, are found mainly in the east and younger Proterozoic rocks that are between 2.5 and 0.6 billion years old are found in the west. Several samples weighing about 20-25kg were collected to get precise ages on these rocks. Some of the Proterozoic rocks in eastern parts of the area, for example at Norris, Castor and Ingray lakes, contain rusty zones (called gossans) that may bear sulfide minerals. Other Proterozoic rocks, near DeVries Lake and near what has been unofficially called Fab Lake, contain alteration zones that elsewhere in the NWT are associated with copper, silver, and gold. Samples (about 1-2 kg) of the gossans and alteration zones were collected to see if they contain appreciable amounts of precious metals. To date some of the samples have been found to contain elevated concentrations of Cu, W, Co, Ag, Au, U, Zn, and Mn.

Technical results from the bedrock-mapping project are presented annually at the Geoscience Forum held in November in Yellowknife and are posted on the NWT Geoscience Office website. Abstracts from the 2007 Yellowknife Geoscience Forum can be viewed on the NWT Geoscience Office website and those pertaining to the Southern Bear project are by Byron, S.J. et al., Corriveau, L. et al., and Jackson, V.A. The results are also published in the form of a map and accompanying report; 2007 results are published in NWT Open Report 2008-007, available through the NWT Geoscience Office.

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File No: 12 404 661 **Licence No:** 14117
Region: IN, GW **Location:** Locations near Reindeer Station; Taylor Channel; Peel Channel; and locations near Kalinek Channel

Variation of near-surface ground temperatures in spruce forests, Mackenzie Delta, Northwest Territories
Permafrost has an important influence on hydrology and ecology of northern environments. An understanding of near-surface ground temperatures will provide a baseline from which to assess change and identify sensitive areas. The objective of this research was to determine the natural variation of mean annual ground temperatures within spruce forests of the Mackenzie Delta. Ecological investigations have identified four spruce forest communities in the

delta based on plant community composition, including spruce-alder/bearberry, spruce-feathermoss, spruce-crowberry/lichen and spruce-tamarack/sphagnum forests. Surface conditions such as canopy cover and thickness of the organic layer vary between these communities. Variable surface conditions may cause differences in ground temperatures between forest communities.

In April 2007, ground temperatures were measured at 24 boreholes that were drilled in summer 2006 (licence 13994) in four areas of the Mackenzie Delta, south of treeline. Measurements were made in April to ensure that ground temperatures had equilibrated from the disturbance of drilling. Measurements of snow depth and density were also taken while at the site for comparison of winter surface conditions between sites. An analysis of the relations between surface conditions and ground temperatures has been conducted. The results will be publicly available in a thesis report.

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File No: 12 404 684 **Licence No:** 14230
Region: GW, SA **Location:** Mackenzie River near Tsiigehtchic, and Great Bear River near Tulita.

Harnessing River Current Power with Helical Gorlov Turbines
No research was pursued under this licence.

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File No: 12 404 116 **Licence No:** 14222
Region: SA **Location:** Within 5 km of the Canol Heritage Trail, extending from Macmillan Pass (Yukon border) to Caribou Pass.

Long-term ecological and geomorphological investigations in the alpine tundra of the Mackenzie Mountains, NWT
A set of treeline/shrubline sites was established for detailed study as part of International Polar Year in 2007. The five automated climate stations were visited and the data in the memory were retrieved. At each of these sites and at two without a climate station the thaw depth was measured at permanently marked sample points. Thaw depth at six of the sites was similar to the rest of the record period however thaw depth on one of the features was clearly much deeper than the others. This study features is also melting from the edges and it is predicted that it will disappear over the next few years. Permafrost continues to warm (~0.8 to 1°C) and melting continues at a rate of -1% of the area of permafrost landforms each year.

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File No: 12 404 515 **Licence No:** 14139
Region: IN **Location:** Melville Island Ice Cap

Mass Balance of Arctic Glaciers
This project is part of a glacier program covering four ice caps and one glacier, one of the ice caps being in the Northwest Territories (Melville Ice Cap). The work involved measuring poles drilled into the ice to see if more ice and snow is melting than it is accumulating. These data are an excellent indicator of climate change. The indications so far are that, although the ice cap is getting smaller (it is 40 m at its thickest) there are still a few years where the snow does not melt during the summer.

The base camp was located at the Polar Continental Shelf Project in Resolute Bay, Nunavut, from where the project's two personnel flew out to the ice cap. While there, they will lived in a small hut by the side of the ice cap, constructed in 2006. There is an automatic weather station on the ice cap, which provides a year-round record of snowfall and temperature. Travel on the ice was by snowmobile and researchers lived in the hut for the two or three days they are there. Results indicate a net loss of 36 cm water equivalent mass averaged across the entire ice cap for the 2006 mass balance year. Small samples (100 grams each) of snow were also collected at several sites to check for acid content.

Data related to this study are published on the Department of Natural Resources - State and Evolution of Canada's Glaciers web site at: http://pathways.geosemantica.net/WSHome.aspx?ws=NGP_SECG&locale=en-CA&c=1.

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File No: 12 404 545 **Licence No:** 14128
Region: IN **Location:** At sites in the Parsons Lake area, Noell Lake area, in the vicinity of Inuvik, and on Richards Island

Environmental Studies Across the Treeline
The overal goal of this research was to investigate the relations between air and ground temperatures across the treeline, to investigate the effects of permafrost degradation on the water quality of lakes adjacent to sumps, and to examine permafrost characteristics in the Mackenzie Delta and the effects of climate change on permafrost conditions.

Environmental conditions (permafrost, soil and vegetation) were collected at 8 sites along a 130-km transect from Inuvik to the Beaufort Sea coast in March and August of 2007. The sites are instrumented to record near-surface ground temperatures at 5, 10, 50, and 100 cm below the ground surface. Results show that both snow depth and the height of vegetation decreases northward along the transect. The deeper snow depths in association with taller shrubs retard ground heat loss and may explain why permafrost is warmer at Inuvik than near to the coast.

Similar information was collected at sites in the outer Mackenzie Delta including sites in the Kendall Island Bird Sanctuary and adjacent areas where a storm surge resulted in terrestrial salinization and large-scale vegetation die off. This information provides a basis for monitoring the ecological recovery of this area.

The distribution and growth of retrogressive thaw slumps was also examined. It was determined that slump activity from 1973 to 2004 was significantly greater than during the preceding 1950 to 1973 period. The effect of permafrost degradation on lake water quality was also assessed. Tundra lakes influenced by thaw slumping have elevated ionic concentrations and lower dissolved organic carbon concentrations than undisturbed lakes. Increased rates of slumping due to climate warming will have a growing influence on the chemistry of tundra lakes.

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File No: 12 404 621 **Licence No:** 14124
Region: NS **Location:** At Daring Lake (64.83 N 111.63 W)

Canadian Tundra Carbon Exchange Project
This reseach has examined the exchange of carbon dioxide between the arctic tundra and atmosphere near the Daring Lake Terrestrial Research Station (TERS) since 2004. Data is collected with instrumentation mounted on tripod towers. In 2007 the researchers visited TERS in the first week of April and set up the main tower site to begin measurements. They later returned in mid-May and set up two additional towers, one in a sedge fen and one in a large patch of birch shrubs located about 1.5 km northeast of the main tower. At least one or more members of the research team were on site for the duration of the project (end of August). Regular visits to the towers were made for data collection, maintenance and to conduct vegetation surveys. They also had two 2-week campaigns of collecting

samples of methane gas emissions from various tundra environments in mid-July and mid-August. All in all this was the most successful field season to date. Although they are still analyzing data, the preliminary conclusions from this summer are as follows. First, 2007 measurements support the previous conclusions that the Daring Lake tundra environments are sinks for atmospheric carbon dioxide during the growing season. Second, the only important tundra source of methane emissions is the sedge fen.

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File No: 12 404 485 **Licence No:** 14153
Region: IN, GW **Location:** Within the Mackenzie Delta in the vicinity of Inuvik.

Biogeochemistry of Lakes in the Mackenzie Delta
See Licence 14155 by Lance Lesack for a summary of this research.

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File No: 12 404 485 **Licence No:** 14155
Region: IN, GW **Location:** Within the Mackenzie Delta.

IPY-SCARF: International Polar Year - Study of Canadian Arctic River-delta Fluxes
The general goals for this IPY Project include: (1) implementing, refining, and testing an enhanced 1-D hydraulic model of river flow (capable of handling ice-jams and storm surge backflows) through the Mackenzie Delta channel network; (2) field investigations of real-time ice jams and measurements necessary for process-based modeling of ice jams at selected locations; (3) linking the hydraulic model to a model of storm surging effects from the Beaufort coast; (4) incorporating new results into long-term modeling of Mackenzie River flows and potential responses to climatic warming; and (5) improved nutrient characterization of the Mackenzie during breakup and open-water. Results will fill a critical data gap (river discharge and nutrient content) associated with river breakup, allow correct quantification of nutrient fluxes to the Beaufort Shelf, and provide a practical tool for predicting water levels through the Mackenzie Delta as climate continues to change.

Though results from fieldwork in 2007 are not yet available, important results from several data-sets on the Mackenzie Delta that underlie our IPY work have been completed this past year. In particular, Lesack and Marsh have shown that over the past 30+ years, summer low-water levels in the delta may have increased by an amount (0.3 m) equivalent to three times local sea level rise (0.1 m) over the same period. Such amplification of recent sea level rise has been unexpected and may be a result of enhanced storm surges in response to receding arctic sea ice or coastal backwater effects on the river flow. Other work suggests a recent decline in river-ice breakup effects in the delta that historically have been an important control on annual peak water levels. If these two changes in the system (via two differing global change mechanisms) are real, fish habitat in the delta may expand, overall biodiversity of the system may decline, and the effects of land-surface subsidence associated with future oil and gas extraction in the region could be higher than expected.

Given the importance of the above results, we have applied for additional funds to expand the research, via improving our ability to model how changing low- and high-water levels will quantitatively affect the area and water volume of off-channel aquatic habitat in the Mackenzie Delta. Such ability will provide a variety of practical benefits (e.g. improved understanding how fish and bird habitat will be affected) that will assist with adapting to the changing river flows and coastal water level regime, as well as enhancing our ability to forecast changes in riverine nutrient fluxes to the Beaufort Sea that are needed by oceanographers investigating changes in the Arctic Ocean.

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File No: 12 404 378 **Licence No:** 14131
Region: IN **Location:** At Trail Valley Creek, Havikpak Creek, northern Richards Island, Zed Creek, and Hans Creek

Hydrological Studies, Mackenzie Delta Region
Field studies were conducted in the Inuvik area during 2007, looking at the factors controlling the movement of energy and water between the land surface and the atmosphere during the spring snowmelt period. These factors control both the supply of energy and water to the atmosphere, as well as snowmelt and therefore spring runoff in the streams and rivers. The long term objective of these studies is to improve the ability to predict weather, climate, and water resources. With future uncertainties in climate, and with potential development projects, such improved predictive ability is essential in order to properly manage future environmental change and to adapt to such changes. The work in 2007 concentrated primarily on measuring total basin snowfall (by the middle of April), as well as the usual automated measurements of solar radiation, air and ground temperatures and summer rainfall.

The ongoing work will compare results from a number of different years so that the researcher can understand the variation from year to year, and will compare results from areas on either side of the tree-line. This work provides important data needed to test computer models, which are used to predict the impact of climate warming on these environments.

In addition to this ongoing study, 2007 saw a continuation of our work on lakes of the outer Delta which involved the measurement of energy fluxes, standard meteorological components, as well as lake inflow/outflow, and water depth and temperature.

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File No: 12 404 582 **Licence No:** 14225
Region: SA **Location:** Sekwi Mountain, Mount Eduni and Wrigley Lake, between latitude 63 00 and 65 00 and longitude 128 00 and 130 00.

Sekwi Mountain Project
During the summer of 2007 (July and August) a team of university-trained geologists (government researchers, university professors and students) did research on the rocks of the Mackenzie Mountains on NTS sheet 106A. The geologists looked at the rocks and made notes, sometimes collecting a small fist-size sample to bring back to main camp. The notes were used during the winter of 2007-2008 to prepare a geological map that shows the distribution of the various rocks of the area. They try to explain how the mountains form, at what time, and under what tectonic regime. The researchers also tried to explain how the rocks were deposited before they were deformed as mountains. A number of students did research for a master degree or baccalaureate thesis, and have been writing reports and doing courses at their respective universities. The government researchers will present their work at conferences in Yellowknife, Whitehorse, Vancouver, Edmonton and Calgary. They have produced a pamphlet for the virtual hiker called “The Geology along the Canol Heritage Trail” as an outreach product, it will soon by available in Yellowknife, Norman Wells, Tulita and Fort Good Hope.

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File No: 12 404 663 **Licence No:** 14246
Region: SA, NS **Location:** Mackenzie Mountains, Mount Clark, McTavish Arm (Eastern Great Bear Lake) and Hottah Lake area.

Central Mackenze Geological Field Program 2007
This geological field program was 6-day program where rock samples were taken from the central Mackenzie Trough and Cambrian outcrops to the east and south-east of Great Bear Lake. An interpretation of the area and its relationship to the subsurface will form the subject of an interpretation report which is currently under preparation.

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File No: 12 404 663 **Licence No:** 14247
Region: SA **Location:** Near the communities of Norman Wells, Tulita and Deline and range as follows: Latitude 64.9 N to 66.2 N Long 124.2 W to 126 W.

Devon Canada Sahtu Gravity Survey 2007
A high resolution long line gravity data set was acquired southwest of Smith Arm in the fall of 2007 and winter of 2008. Gravity data are measurements of variations in the Earth's gravitational field. These variations are caused by contrasts in rock density and distance from the measuring instrument at the surface of the earth.

The geologic fabric, main structural features and trends are seen in this gravity study. Southwest to northeast trending strike-slip faults are observed. They are presented as abrupt terminations of gravity high and low values along lines with the above orientation.

Several exploration leads for structural Proterozoic highs were observed. These positive gravity anomalies present as rectangular to oval shaped features. Their edges are roughly parallel to the strike slip fault trend. Proterozoic lows contain younger sediments. These sediments are less dense than the Proterozoic and exhibit low gravity values. The potential high and low areas mapped by gravity roughly correlate to those mapped using the existing seismic data.

Thrust faults in the study area are oriented from northwest to southeast. Narrow elongate bands of high gravity values delineate these thrust faults. Surface geology mapping confirms that these gravity expressions represent dense Devonian age rocks at or near surface.

This gravity survey defines the north west boundary of the Bracket Basin which contains Tertiary aged sediments. This boundary follows a prominent strike slip fault that is oriented from the southwest to the northeast.

The gravity work successfully highlighted some areas with exploration potential for the Cambrian sandstone play and can provide good guidance to lay out seismic programs to map the areas of interest in greater detail. The use of gravity proved to be a cost effective method to map the main structural trends and features in this remote area.

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File No: 12 404 480 **Licence No:** 14228
Region: SA **Location:** On two Ice Patch study sites in the Mackenzie Mountains (63.235332 N 129.513992 W and 62.966117 N 129.334767 W).

Northwest Territories Ice Patch Study - Geophysical Project
Ice patches in the Mackenzie Mountains are areas of permanent ice that last through the summer months and often contain frozen caribou remains (mostly dung) and archaeological artifacts such as hunting weapons and tools. As the climate warms, these ice patches are beginning to melt, and there is a risk of losing the biological and archaeological information they contain. Using a technique known as ground penetrating radar, this study was designed to determine how fast these ice patches are melting.

Ice coring (2-4 cores measuring ~10 cm in diameter/ice patch) was undertaken at the two ice patches and a small weather stations was set up at each ice patch study site to monitor local climatic conditions.

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File No: 12 404 662 **Licence No:** 14116
Region: IN **Location:** Eleven sites in the Kendall Island Bird Sanctuary

Relations between snow, near-surface ground temperatures, and ground ice, Kendall Island Bird Sanctuary, Mackenzie Delta, NWT
It was a successful year, with only minor logistical hitches. Segregated ice sampling was completed along the snow courses, and throughout the study area, and we obtained several good permafrost cores. Ground temperature data was downloaded from loggers installed in 2006, and the loggers were re-launched to record for a second year. A number of the sites were "vandalized" by wildlife and had to be re-instrumented.

Preliminary analysis indicates that ground ice contents are more strongly influenced by the soil physical properties, moisture contents, and geomorphic setting, which reflects and process and duration of ice formation, than by ground temperatures. These data are now being examined in detail, and when the reports are written a copy will be forwarded to your office. There was a novel permafrost feature at KIBS that bears further investigation.

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File No: 12 404 398 **Licence No:** 14172
Region: DC, GW, IN, SA **Location:** Sixty sites between Fort Simpson and the Beaufort Sea Coast

Active Layer Monitoring Network in the Mackenzie Valley
During August 2007, the 17th annual survey of the active layer monitoring system in the Mackenzie Valley was completed from Fort Simpson to the Arctic coast. Sites now number 51, about half in the Mackenzie Delta. Ten have been selected for the Circumpolar Active Layer Monitoring program of the International Permafrost Association.

Along this 1400 km transect, active layer thickness varies more as a result of local factors, related to situation, than to regional climate, associated with latitude. Though both air and ground thawing degree days increase from Arctic through Sub-arctic to Boreal environments, active layer development is surprisingly similar, except were local factors override regional patterns. The thaw of 1998 was the greatest yet recorded, in keeping with record warm temperatures, while thaw in 1996 north of Norman Wells and in the current century at many sites was notably less than during the late 1990s, also associated with temperature and season length significantly less than normals. 2006, however, was the warmest year thus far this century and thaw reflected this at almost every site. The widespread response to these events builds confidence in the utility of the instrumentation for measuring response in the ground to atmospheric change. Data from this monitoring has been used for Mackenzie Gas pipeline designs and has assisted in environmental assessment of proposals. In the longer term, measurements from this transect will be used to help model climate change impact on near surface permafrost in this fragile environment.

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File No: 12 404 640 **Licence No:** 14126
Region: IN, GW **Location:** Sixteen dendrochronology sites and fifteen lake sites on the outskirts of Inuvik

Environmental change in the 20th century, Mackenzie Delta region, Northwest Territories
In the spring and summer of 2007 two research projects were carried out in the Mackenzie Delta under the broad umbrella of Environmental Change in the 20th century. The first project aimed to closely examine the climatic controls of tree growth at northern treeline. Automatic dendrometers were installed on 15 trees at a site referred to as Blueberry (133 50'05" 68 25'00"). The dendrometers recorded growth of each tree during the growing season. This data is being combined with weather dated collected on site to better understand the relationships between tree growth and weather (i.e., temperature, precipitation, solar radiation) and forms a major portion of the M.Sc. thesis being prepared by Greg King (expected completion Spring 2008). The researchers also collected tree cores from white spruce at 13 sites in the Mackenzie Delta. These samples are being examined by Trevor Porter as part of his

doctoral studies. The second major research project, collected lake sediment cores from 6 lakes in the vicinity of Noell Lake. Surface sediment cores (approximately 20-60 cm in length) were collected from each lake in March 2007. Diatoms contained in the sediment from these cores are being analysed by Joshua Thienpont at Queen's University as part of his M.Sc. research. Analysis of charcoal contained in the sediment is also planned and should be completed by the summer 2008. Several of the cores have been dated using 210-Pb methods at the University of Ottawa and Queen's University.

In March of 2007 Michael Pisaric spoke to students in two science classes at Samuel Hearne Secondary School. There he discussed the research he was carrying out in the Inuvik region and talked about the impacts of climate change on northern forests.

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File No: 12 404 635 **Licence No:** 14122
Region: GW, IN **Location:** Middle Channel near Horseshoe Bend, East Channel (Scour Hole #10), near Willy Simon's cabin, and Tsiigehtchic

Evaluation of extreme events (ice jams) and deep scour holes on Mackenzie Delta Channels
The objective of the 2007 field campaign was to carry out field observations of the ice breakup process in the lower Mackenzie River and upper delta channels and to continue investigations of channel morphology in the delta. The breakup program was completed in May, using ground and air access. The 2007 breakup was uneventful, and no significant jamming was noticed in the delta channels. Numerous cross-sections were surveyed from late August till early September in the Middle Channel reach between Point Separation and about 10 km below the Horseshoe Bend, using boat access. On the same trip, several cross-sections were also surveyed on the East Channel near its upper confluence with Middle Channel. These cross sections will be mainly used for modelling the water levels caused by ice jams in the Middle channel and in the upper East Channel, two of the areas known for jamming within the delta. At the researchers request, Water Survey of Canada carried out a set of flow and velocity measurements using a boat-mounted ADCP (Acoustic Doppler Current Profiler) in the area of Scour Hole #10 (September 12). Coupled with earlier surveys, this information will help assess the stability of the scour hole.

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File No: 12 404 635 **Licence No:** 14123
Region: IN **Location:** At 66 lakes located on a transect north of Inuvik

Sensitivities of high-latitude lakes to climatic & development disturbances
The third year of full-scale sampling for this project was completed in 2007, following sampling in 2005, and 2006 and preliminary work in 2004. The goal of this work is to understand the effects of permafrost degradation on the supply of nutrients to tundra lakes, and on the biological communities within the lakes. Three field campaigns were completed during the 2007 season. During May, water quality, biological and isotope sampling were completed at 9 lake sites. A visit was also made to a pair of lakes for a comparative study initiated in 2004. This early season sampling trip will provide information on the lakes prior to the spring melt. In late June/early July, chemical and physical water sampling were performed at the 9 lakes. Biomass sampling was meant to obtain a more representative sample of the lake sites including algal and bacterial sampling. During August, chemical and physical water sampling at the 9 lake subset and a further 22 lakes took place, along with collection of phytoplankton, bacterioplankton, and zooplankton for identification and quantification. Analyses completed so far indicate that the water chemistry impacts of permafrost degradation determine the limiting factors for phytoplankton growth in these lakes.

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File No: 12 404 570 **Licence No:** 14102
Region: DC **Location:** At Scotty Creek (61° 18'N 121° 18'W)

Stream flow generation in wetland-dominated zones of discontinuous permafrost
In the last year, the following advances were made in this project. Areal photographs and satellite images were compiled for the study site near Goose Lake, for the period 1947-present. These images were examined for changes in permafrost and tree coverage. It was found that there was about a 30% decrease in both over this period. The results of the on-going studies at this site, suggest that this change in forest and permafrost cover will result in changes in the way drainage basins convey and store water, and this in turn will produce changes in stream flow. The researchers have also expanded the focus of the study to include to effect of these landscape changes on the amount of CO2-gas entering the atmosphere from the land. In August, 2007, they obtained Lidar image data for Scotty Creek. This provides highly-detailed information on the topography and the structure of the tree canopy. This information will be used to develop detailed maps on the: 1) direction of water drainage; and 2) amount of energy reaching the ground surface, that is used to thaw the ground. The second point will help illustrate variations in thaw depth of the ground, and permafrost distribution. This is a critical step toward developing methods that communities can use to estimate soil and permafrost thaw, and the effect of these on water drainage and streamflow.

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Region: SA **Location:** The study area closely coincides with the Edailla area of interest, northeast of Great Bear Lake.

Geology of the Hornby Bay Basin
The area the research is taking place straddles the Nunavut-NWT border and no work was conducted under this licence.

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File No: 12 404 675 **Licence No:** 14186
Region: NS, SS **Location:** In the general area of Kennady Lake (63.4453 N, 109.2119 W).

Gahcho Kué Project - Soils and Terrain Baseline Studies
During the summer of 2007, a soil and terrain field survey was conducted in the area of the De Beers Canada Inc. proposed Gahcho Kué Project located at Kennady Lake, NT. This work was conducted from July 16 to 20.

Soils and terrain were described at 71 inspection sites. These sites were located within the proposed project footprint area and at the southwest esker. The survey involved the collection of detailed terrain and soils information. Soil data included soil classification, and soil horizon thickness, morphology and physical/chemical properties. Terrain classification involved the identification of soil parent material, drainage, surface expression, slope, aspect, stoniness and rockiness. Photographs of the landscape were taken at each site.

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File No: 12 404 681 **Licence No:** 14214
Region: IN **Location:** Taglu D-43, Taglu G-33 and Ivik J-26 well sites, in the Mackenzie Delta region of the Northwest Territories (NWT).

Taglu D-43 Well Site Surficial Clean Up and Sump Assessment; 2007 Taglu G-33 Well Site Surface Clean Up and Sump Assessment; and 2007 Debris Clean Up at Ivik J-26 Well Site
The purpose of this project was to conduct debris clean up and further environmental assessment of the drilling sumps at the Taglu D-43 and G-33 well sites, as a follow-up to the 2004 limited investigation to confirm sump contents are appropriately contained.

The 2007 investigations included:

- A site inspection that included an inventory of visible or partly buried debris, piling accessibility, and the collection of additional qualitative information regarding vegetation, erosion and sump dimensions;
- An environmental assessment of the drilling sump area that includes the collection of surface water and shallow (less than 1.0 m below ground) and deep (1.0-4.0 m below ground) soil samples.

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File No: 12 404 681 **Licence No:** 14215
Region: IN **Location:** Tuktoyaktuk Base Camp (69'27'N, 133'02'W).

2007 Tuktoyaktuk Base Camp Decommissioning and Clean-Up
Imperial Oil Limited (IOL) is in the process of completing site assessment and clean up activities at the Tuktoyaktuk Base Camp. This site is an operating lease (lease ILA 8500107) held by IOL from the Inuvialuit Land Administration (ILA). IOL's current lease agreement with the ILA extends to 2014.

2007 field research activities included: installation of four piezometers and sampling of unfrozen piezometers installed in 2001; surface water sampling at seven locations; advancement of 45 boreholes and submission of select soil samples for laboratory analysis; sample drilling materials seacans and characterize waste for off-site landfill disposal; complete underwater survey in the vicinity of the docks; conduct building inspection (IOL).

Based on the analytical data and the visual observations at the site it is estimated that there are approximately 20,500 m^3 of hydrocarbon impacted soil (in-situ volume) on the site. It is further estimated that there are at least 49,250 m^3 of debris (in-situ volume) within the main landfill area. Partially buried debris was also noted in the slope to the south of the old warehouse buildings. Geophysics in the area confirmed the presence of buried metallic debris that appears connected to the main landfill area. Excavation to the base of the main landfill was impractical due to the large size of debris (e.g. rig mats, heavy tangled cables, possible metal decking material). Below 0.5 m, the landfill contents were generally inert debris with minimal soil

The analytical results for the samples collected from the Seacans of historic drilling mud additives indicates that six of the twelve Seacans containing bulk Barite have leachable lead concentrations which exceed the Class II Landfill acceptance criteria of 5 mg/L. As well, five of the other Seacans have detectable leachable lead concentrations from 1.4 mg/L to 4.4 mg/L.

Historical groundwater data collected in 2001 indicated the presence of dissolved hydrocarbons in a number of locations throughout the site. During the 2007 sampling of the historic wells a number of the wells were frozen and could not be sampled. Detectable levels of hydrocarbons were found at one piezometer location. No BTEX or PHC F1 hydrocarbons were detected in the 4 piezometers installed in 2007.

The analytical results for the surface water samples collected throughout the site showed no detectable hydrocarbons but do show the presence of total metals concentrations above CCME Freshwater Aquatic Life guidelines but all concentrations from the surface water on site were similar to the concentrations detected in the sample of the creek water (WS07-1) and in all cases the concentrations in the creek (background) sample were higher. Micro-toxicity analysis of the water samples collected from the sewage lagoon and the creek to the east of the Site showed no adverse / toxic effects.

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File No: 12 404 668 **Licence No:** 14091
Region: DC **Location:** Near km 566 on the Mackenzie Highway and approximately 60 km south from checkpoint near where the pipeline crosses the road

Active layer moisture and carbon dynamics in the wetland-dominated zone of discontinuous permafrost
The research objective is to provide better quantification of the effects of climate change on the groundwater and surface water of Canada's subarctic regions. The focus is on quantifying the hydrologic response of wetland dominated discontinuous permafrost to atmospheric temperature and solar variations. Specifically large-scale experiments on peat soils from the Central Mackenzie River basin will better elucidate moisture transport processes occurring in the active layer. These climate forcing laboratory based experiments will be closely integrated with on-going field studies in the basin.

Sample extraction took place in August 2007 at the research team's current field site, located at Scotty Creek 50 km south of Fort Simpson. A total of four peat samples 60 cm in diameter and 60 cm deep (to frost table) were taken; two containing lichens, two mosses. Samples were then shipped to the new experimental climate change facility at the University of Western Ontario (Biotron). The soil samples and climate chamber will initially be set up to replicate hydrological and meteorological conditions measured at the Scotty Creek research site. Research will then focus on how the hydrogeological properties of active layer change with varying atmospheric forcing (solar, air temperature, precipitation, CO_2) consistent with published climate change scenarios.

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Region: NS, SS **Location:** In the general area of Kennady Lake (63.4453 N, 109.2119 W).

Gahcho Kué Project - Hydrology Baseline Work
Hydrology field studies were conducted within the Kennady Lake and Kirk Lake watersheds in 2007. This work was carried out during two visits, August 29 to September 3 and September 26 to 28. The purpose of the research was to extend the data set and fill data gaps for the baseline information related to the De Beers Canada Inc. proposed Gahcho Kué Project. Types of data collected included continuous lake water levels (hydrometric stations), discharge/water level measurements, lake outlet cross-sections and substrate types.

Three hydrometric stations were installed in late August to collect continuous water level data through to the end of September. Where discharges were measured, at least two measurements were taken at different discharges. A detailed channel survey was conducted at the outlet of Lake N11, which consisted of 16 surveyed cross-sections along the length of the channel to the Lake N1 inlet. Discharge and channel measurements were attempted at the Kirk Lake outlet but were abandoned due to fast moving water. All equipment was removed at the end of September.

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Region: IN **Location:** Niglintgak area; Kittigazuit S-Bends; Camp Farewell; private facility in Tuktoyaktuk

Shell Canada Limited Niglintgak 2006/2007 Winter Field Program
The objective of the proposed fieldwork was to gather information to develop a suitable knowledge base for project planning, assessment of impacts and drafting of environmental protection plans related to the development of the

Niglintgak natural gas field.

A geotechnical survey was conducted to collect information on permafrost. Thermistors were installed in boreholes, and the depth of the active layer and the boundaries of thick ice was determined. Boreholes were alos used to assess HDD alignment and scope changes that have occurred since the 2005 geotechnical survey.

Material from some of the boreholes were use to collect a representative of the sediment that will be excavated and disposed of during the preparation of the site. Shallow sediment samplings were also conducted at the test pit location. These samples were analyzed for particle size, moisture content, total organic content, metals, and hydrocarbons.

A test pit located below the high water mark was excavated using an IronWolf Crusher to conduct permafrost degradation testing to test an insulated foundation designed to protect permafrost. The excavation also tests the performance of the IronWolf in the winter climate conditions.

Spring break-up peak water level were monitored and flood depths measured in the vicinity of the site. Confirmation of peak water levels was needed to ensure the planned structure is above the maximum water levels.

Testing to identify the most effective GCF ballast tank for the northern climate was conducted at a facility in Tuktoyaktuk. An experimental tank was designed and fabricated. Each compartment configuration was monitored to see how effectively pressure is relieved throughout the freeze/thaw process..

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File No: 12 404 587 **Licence No:** 14164
Region: NS **Location:** Upland tundra (64.868N, 111.575 W) in the vicinity of the Daring Lake Terrestrial Ecological Research Station

Climate Change Impacts on Canadian Arctic Tundra Ecosystems: Interdisciplinary and Multi-scale Assessments: Spatial and Temporal Variation
Nitrogen is one of the major nutrients for all living organisms and is a key factor limiting plant growth in cold northern environments. An important source of nitrogen in arctic tundra ecosystems is nitrogen fixation by cyanobacteria that live on both soil crusts and mosses. During June, July and August of 2007 spatial and temporal variation in N-fixation by cyanobacteria were evaluated at the Tundra Ecosystem Research Station at Daring Lake, NWT.

N-fixation was assessed in areas of upland heath mat, lowland birch hummock and wet sedge meadow. The rates of N-fixation were highest in upland areas with soil crusts during the early growing season. During mid-summer the highest fixation rates occurred in areas of lowland birch hummock with mosses. Wet sedge meadows had relatively high and constant fixation rates over the growing season.
Measurements of moisture, light and temperature were taken to determine their effects on daily and seasonal variation in N-fixation. Moisture was found to be important for regulating N-fixation with higher rates of fixation occurring immediately after rainfall events.
University of Northern British Columbia researchers collaborated with a Northern student, who had the opportunity to gain scientific field skills while making important contributions to the project.

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Region: SA **Location:** East and West of the Mackenzie River Valley in the Sahtu region.

Sahtu Karst Study
Karst landscapes form where rock dissolves in water, creating features like sinkholes, caves, dry gorges, and poljes (large depressions drained underground). Karst landscapes often have spectacular scenery and unique communities of plants and animals. Understanding the geology and the flow of ground waters through karst rocks can help to

understand the environmental effects of various land uses.

A report was produced that describes some of the most important karst sites in the Sahtu region and gives recommendations for protecting them. There are some very interesting and significant karst sites in the Sahtu region. These include: the Vermilion Creek sinkhole; some features of the Mahony Dome; Ration Creek sinkhole; Bear Rock; and many features of exceptional quality and significance in the Canol Trail area (from the Plains of Abraham to Carcajou, Dodo and Katherine canyons, including: Pyramid Lake Polje; Dodo Dry Canyon; Dodo West Karst Pavements; Dodo Breccia Drape Karst; Great Fan Landslide; Western Great Spillway and Fan; as well as the Bonus Lake Scablands and Moraine Polje). The sites in the Canol Trail area are so significant that they are worthy of UNESCO International Geopark and World Heritage status.

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File No: 12 404 657 **Licence No:** 14088
Region: GW, SA, DC **Location:** Forty-four sites in the Gwich'in Settlement Area, Sahtu Settlement Area, and the Deh Cho Region

Enhancement of Permafrost Monitoring Network and Collection of Baseline Terrain Information in Mackenzie Valley Corridor, NWT

A major field program was conducted in 2007 to collect baseline environmental information and establish permafrost temperature monitoring sites in the Mackenzie corridor. Boreholes were drilled with an auger drill in February and March 2007 in the Deh Cho and Sahtu settlement regions. Jet drilling was conducted in the Gwich'in settlement region in August 2007. Local contractors and environmental monitors participated in the field program. During drilling in the Deh Cho and Sahtu, field descriptions of soils (including ice content) were recorded and soil samples were collected and further analysed to provide detailed descriptions of surficial materials. A total of 41 boreholes were preserved as monitoring sites and temperature cables were installed in most with the remainder to be installed in 2008. Dataloggers were connected to cables to provide a continuous record of ground temperature. Preliminary temperature data during the first 6 to 7 months of operation has been acquired. Long-term maintenance of monitoring sites with continued data collection is planned in order to better characterize the changes in permafrost conditions and the impact of climate change.

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File No: 12 404 548 **Licence No:** 14208
Region: NS **Location:** Castor Lake (64.43 N, 116.02 W); Gameti airport (64.12 N, 117.31 W); ILKN (64.22 N, 115.13 W), and an unnamed place at 64.17 N, 118.17 W.

Teleseismic studies in the Lac de Gras area

Six seismic observatories continue to acquire earthquake data, four are located near Gameti and two near the Jericho diamond mine. The goal is to mark the limits of the most ancient parts of the Earth at depths of 100-300 km. Two papers published recently discuss the likelihood that the Earth beneath the NWT diamond mines was originally formed by the underthrusting of one plate or layer beneath its neighbour. This underthrusting provides a good explanation how this region became enriched in carbon at depths appropriate to form diamonds. It may also explain why many kimberlites have erupted in this area.

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File No: 12 402 623 **Licence No:** 14157
Region: IN, GW **Location:** Near Inuvik: 1-2 km north of town airport and 5km south of town by the Dempster Hwy; near Tuktoyaktuk: 2-3km radius of the village.

Arctic Analogues of Utopia and western Elysium Planitia, Mars
The occurrence of relatively fresh near-rim gullies on the walls of some impact craters on Mars raises interesting questions about the existence of near-surface ground-ice and climate scenarios associated with obliquity shifts, as Martian boundary conditions currently are inconsistent with the presence or flow of surface water. Uneroded thermokarst-like depressions on the margins and floors of these craters suggest that water could have been present in the gully region very late in the geological history of the Red Planet. At Eskimo Lakes, NWT, scarp-side gullies underlain by thick tables of massive ice (thought to be thousands of years old) are widespread along the lake margins. Measurements of ^{14}C within the ice overburden as well as within the ice itself were taken and are being evaluated. Despite episodic fluctuations of temperature since the onset of the Holocene, the massive ice has been preserved. Similarly, were near-surface ground-ice responsible for the formation of the Martian near-rim gullies, a regolith-blanket metres thick could have protected the ground-ice from sublimation in the period following its emplacement. The data returned from the ^{14}C sampling and further isotopic analyses will enhance the discussion about the long-term preservation of near-surface ground ice on Earth and, possibly, on Mars too.

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File No: 12 404 636 **Licence No:** 14150
Region: IN, GW **Location:** LOT 8, PLAN 50540, GROUP 1355, Inuvik (68º24’52”N, 133º46’11”W).

PolarDARN - The northern hemisphere polar portion of the international SuperDARN (Super Dual Auroral Radar Network) program
The year 2007 has been a landmark in the SuperDARN community because of the completion of the PolarDARN radar installations. The radar at Inuvik was turned on for initial testing on October 25, 2007. After a 6-week trial period revealed a few problems, a return trip to Inuvik in December by SuperDARN Engineer Jan Wiid led to excellent radar performance, at a level comparable to that of the Rankin Inlet radar, which began operating on May 11, 2006. What is remarkable about these PolarDARN radars is that, in spite of having been turned on during the minimum of Solar Cycle 23 when HF radar propagation conditions are usually at their worst, the radar echo occurrence for these radars has been high, better than the other 11 northern hemisphere SuperDARN radars. The results show that the polar cap region into which the PolarDARN radars look is very dynamic even when solar activity is not. This would appear to confirm that the high-latitude locations of the PolarDARN radars is ideal. The reason for this is that the magnetosphere, the magnetic region surrounding the Earth, is set in motion by an important astrophysical process called magnetic reconnection, which occurs in space at the boundary between the “open” and “closed” magnetic field lines of the earth. That boundary, called the open-closed-field-line-boundary (OCFLB), maps down to the polar cap region that the PolarDARN radars examine. During the relatively “quiet” conditions that have occurred during 2006 and 2007, that boundary would be located frequently at high latitudes that are examined by the PolarDARN radars.

The new Solar Cycle 24 began early in 2008, and so the PolarDARN radars, along with the rest of the SuperDARN network, will see an increase in the number of echoes over the next four years. These result from the increase of the activity of the Sun, in particular the increased speed and density of the “solar wind” that carries electrically charged particles from the Sun to the Earth. The PolarDARN radars examine the high-latitude “polar cap” gap that the auroral zone radars could not detect. The auroral zone SuperDARN radars will see an increasing echo occurrence as the cycle grows to a maximum around 2011. The PolarDARN and SuperDARN radars will be a powerful combination for the relatively new study of “space weather”. When the solar wind is strong, “magnetic storms” occur that are very dangerous for astronauts in space, as well as for the delicate electronic systems on the roughly 800 telecommunications satellites in space. At a cost of about $200 million per satellite, these 800 satellites represents an investment of roughly $160 billion and they are responsible for most international banking, television and telephone transmissions, pagers, and internet signals. When the space weather is disturbed, the astronauts must not venture outside the Space Station, and the satellite electronics can be damaged. The international SuperDARN network, funded by ten nations, is designed to measure the voltages in space, because those voltage control space weather by driving the electrically charged particle winds in space, just as weather systems near the ground are driven by low and high pressure systems. With the Rankin Inlet and Inuvik radars providing vital new data in the polar cap region that was not seen well before PolarDARN, the study of space weather should be greatly improved. That is

why the PolarDARN radar installations in 2006 and 2007 were so critical for the international SuperDARN network and for the study of weather conditions in space.

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File No: 12 404 319 **Licence No:** 14127
Region: IN **Location:** At sites on the Mackenzie Delta and mainland coast, Banks Island, Victoria Island, Prince Patrick Island and Melville Island

Geological conditions affecting industrial and community development in the coastal and nearshore regons of the western Canadian Arctic
Most of the research during 2007-08 was focused on the Mackenzie Delta region. Surveys were undertaken in the spring to study breakup processes at the mouth of the river. “Strudel” drainage features were discovered – these form when water overflows onto the surface of the sea ice then drains through cracks and holes. Surveys in the summer (August) were undertaken to map seabed features including any evidence of scours which formed beneath the strudel drains. The researchers found several of these “strudel scours” with the largest being about 15 m in diameter and 1 meter deep. They also found ice scours up to 0.5 m deep in water depths of 3-6 m. Instruments were put onto the seabed to record the waves, tides, currents and sediment in the water column. The instruments were recovered in September. There were very few big wave events because the winds blew from the south and east so much. This caused very low water levels throughout the fall. Another part of the study uses global positioning systems (GPS) to measure the rate that the land surface is moving up and down. There twelve established sites in the region (including Inuvik and Tuktoyaktuk). Data from the surveys are still being analyzed.

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File No: 12 404 674 **Licence No:** 14145
Region: NS, SS **Location:** Matthews Creek Project Site, between Courageous Lake and Matthews Lake.

Hydrometric Survey and Meteorological Station Installation and Monitoring - Matthews Creek, NT
Hay and Company Consultants (Hayco), a Division of EBA Engineering Consultants Ltd., have been conducting hydrometeorological studies for Seabridge Gold Inc. at Matthews Creek since 2005.

With the inclusion of the 2007 Matthews Creek discharge data, the stage discharge relationship of Matthews Creek was improved, which resulted in changes to the 2005 and 2006 hydrographs. As a result, maximum and minimum discharge estimates for 2005 and 2006 have therefore changed slightly. For 2007, the maximum recorded discharge of 1.42 m^3/s for Matthews Creek occurred on June 13. Creek flows reduced in volume over the summer and fall. The minimum recorded flow in 2007 of 0.09 m^3/s occurred on September 19, just prior to the creek freezing over.

Creek water temperatures recorded over the same period ranged from 20°C just after the freshet to near freezing just prior to the creek freezing over. The meteorological station, installed on site in August 2007, has continuously recorded the meteorological parameters of wind speed and direction, air temperature, relative humidity, solar incident radiation and precipitation since its installation. Winds were commonly in excess of 3 m/s, especially in August. The maximum wind speed recorded was 16.8 m/s. The wind blew
predominantly from the WNW in August and from the NNE in September. The mean daily air temperature over the period of record ranged from 15°C to -3ºC with a maximum recorded temperature of 22 ºC and a minimum of -5.5°C.

Daily peak incident radiation ranged from 1080 W/m² at the beginning of August to 740 W/m² in mid-September. Relative humidity at the site ranged between 35% to 100% with an average daily mean of 80% over the period of record. Sea level equivalent barometric pressures ranged from a minimum of 1001 hPa to a high of 1025 hPa over the entire period, with the daily mean showing an increase of 7 hPa over a 41-day period of record. The total amount of water-equivalent precipitation recorded over the 41 days was 40.6 mm. The meteorological station is currently

active and recording weather parameters at the Matthews Creek site. Observations from mid-September until December 2007 will be presented in the 2008hydrometeorological survey report.

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File No: 12 404 667 **Licence No:** 14086
Region: IN, GW, SA, DC, NS, SS **Location:** Across the Northwest Territories, where forest fires break out

Increasing Boreal Forest Fire: Future Impacts on Arctic Environment and Climate
No research was pursuant on this licence.

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File No: 12 404 673 **Licence No:** 14143
Region: NS, SS, GW, SA **Location:** Yamba Lake, Lac de Gras, Aylmer Lake, Clinton-Colden Lake, Moraine Lake

Alaska-Canada Barren Lands Traverse
Five Alaskans and two Canadians traveled by snowmobile from Fairbanks, Alaska to Baker Lake, Nunavut between March 16th and April 30th, 2007. The purpose of the trip was scientific, educational, and exploratory. By the end of the trip, approximately 4300 km had been covered.

Snow depth and snow property measurements were made in Alaska and Canada. Two types of snow were encountered: Taiga snow in the forests (fluffy and soft, usually with a lot of depth hoar at the base), and Tundra snow where the wind could affect snow conditions (wind-packed, drifted, with depth hoar overlain by windslab). It was expected , but is still surprising, that the Tundra snow in Alaska is virtually identical to the Tundra snow in Baker Lake. In short, this type of snow is ubiquitous and could be called the typical snow pack of NWT and Nunavut. The ice on Great Bear Lake ranged from 1.5 to 2 m thick, with thicker ice (and thinner snow cover) as we moved north from Deline to the Dease River. This inverse relationship between ice and snow is well known, but was particularly striking on Great Bear. The presence of lake ice makes remote sensing of snow by satellite difficult. The presence of large and innumerable small lakes in NWT and Nunavut suggest to us that it is going to require considerable more research and development before remote sensing of snow resources in these territories becomes operational.

The researcher maintained a website: www.barrenlands.org that has local history, science, and cultural content, as well as daily dispatch from the field.

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File No: 12 404 658 **Licence No:** 14098
Region: IN **Location:** East Round Lake (68°41.3'N 133°54.1'W), 35km N of Inuvik

Mackenzie Valley Landslide Geotechnical Investigations
The objectives of this research were to conitinue to investigate slope failure mechanisms associated with landslides in the Mackenzie Valley and to improve the understanding of triggering factors and slope failure mechanisms of landslides in frozen or thawing ground. More specifically, the objective of the project was to better understand the landslide triggers and slope failure mechanisms in permafrost region. The work in
2007 mainly involved in surveys of movement rates of several landslides in the specified area north of Inuvik. Some small soil samples were taken from the landslide scarp walls where permafrost was exposed. The samples were sent to a GSC laboratory in Ottawa for geotechnical property testing.

The instruments installed in 2006 at an active landslide site at East Round Lake (N68°41.3' W133°54.1') were monitored as an ongoing process. Those instruments were measuring the slope behaviour and weather data. As a result of this overall project, two papers were published at two international conferences: one at the 1st North American Landslides Conference, Vail, Colarado, June 2007, and one at the 8th International Symposium on Cold Region Development, Tampere, Finland, September 2007. An abstract further summarizing the latest findings was also published at the 35th Annual Geosience Forum, Yellowknife, NT, November 2007.

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File No: 12 404 658 **Licence No:** 14108
Region: GW **Location:** Around an existing landslide on a small lake (N67°40.0' W131°31.8') located southeast of Travaillant Lake

Mackenzie Valley Landslide Geotechnical Investigations
The objective of the project was to better understand the landslides in permafrost region. The work in 2007 mainly involved in surveys of movement rates of several active landslides near Travaillant Lake, south-east of Inuvik. Some small soil samples were taken from the landslide scarp walls for geotechnical property testing. The instruments installed in 2006 at an active landslide site about 5 km east-southeast of Travaillant Lake (N 67º 40' W 131º 31.8') were monitored as an ongoing process. Those instruments were installed to measure soil geotechnical behaviour and collect weather data. In addition, two test plots of about 6x20 m were excavated with hand shovels next to the active landslide at the above site.

As a result of this overall project, two papers were published at two international conferences: one at the 1st North American Landslides Conference, Vail, Colarado, June 2007, and one at the 8th International Symposium on Cold Region Development, Tampere, Finland, September 2007. An abstract was also published at the 35th Annual Geosience Forum, Yellowknife, NT, November 2007.

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File No: 12 404 599 **Licence No:** 14109
Region: SS **Location:** In the Slave River Delta, near Fort Resolution

Paleohydrology and Paleoecology of the Slave River Delta
The impact of climate change and variability on water resources is one of the more pressing issues facing northern Canada. Indeed, water in northern Canada plays a central role in shaping the landscape, maintaining the ecological integrity of ecosystems, economic development and prosperity, and traditional use of the land and its resources by indigenous communities. In the Peace-Athabasca-Slave River Corridor in northwestern Canada, shrinking headwater glaciers, decreasing alpine snowmelt runoff, and declining river discharges impact sustainability of hydroelectric and oil sands production and the vitality of floodplain ecosystems of the Peace-Athabasca and Slave River deltas. In the Old Crow Flats of northern Yukon Territory, declining lake and river water levels threaten wildlife populations and cultural activities of the Vuntut Gwitchin First Nation. The Peace-Athabasca-Slave River Corridor and Old Crow Flats are internationally-recognized northern, freshwater ecosystems experiencing environmental changes, but inadequate short- and long-term understanding of hydroecological variability and its relationship to changing climate hamper effective multi-stakeholder ecosystem management.

In partnership with organizations that include northern First Nation communities, educational institutions, government agencies, and industry, the NSERC Northern Research Chair Program in Northern Hydroecology targets critical water-related issues in the Peace-Athabasca-Slave River Corridor and the Old Crow Flats. Research approaches focus on integrating contemporary hydroecological studies, spearheaded by the use of water isotope tracers, with quantitative long-term (past decades to millennia) records of hydroecological changes derived from analyses of lake sediment cores using state-of-the-art multi-proxy techniques. The temporal insight gained from these approaches is needed to inform stewardship of these important ecosystems to contemporary conditions and in light of projected

future scenarios.

In March 2007, fieldwork was conducted to collect sediment cores from several lakes in the Slave River Delta. These records will provide critical temporal hydroecological context for addressing the impacts of changes in climate and Slave River hydrology on the delta. Fieldwork participants included graduate students (Adam, MSc; Brock, PhD; Harms, MSc) and an undergraduate student (Barkhouse, BES). Multi-proxy analyses are being conducted on the sediment cores to reconstruct past hydroecological conditions. Cores collected and results generated from subsequent multi-proxy analyses are components of graduate (Brock, PhD; Harms, MSc; Ennis, MSc) and undergraduate (Ennis, BSc) theses.

Several community outreach activities were conducted. Community leaders spent a day in the field participating in the collection of sediment cores. An open house was held at the community hall in Fort Resolution where an overview of research findings from studies conducted since 2002 was presented. In addition, plain language research pamphlets were distributed, which highlighted important results generated from interdisciplinary research. A research presentation was also delivered to grade 7-12 classes at Deninu School in Fort Resolution and plain language posters were given to the teachers to assist delivery of science curricula.

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File No: 12 404 614 **Licence No:** 14213
Region: IN **Location:** Big Lake, Middle Channel and the general area of northwest Richards Island.

Integrated Geoscience Studies of the Mackenzie Delta and Nearby Coastal Environments
Gas flux measurements from three active methane seeps east of Middle Channel were first carried out in 2006 were repeated in August 2007 to determine whether discharge rates are consistent over time. The objective of the October 2007 field work was to conduct an aerial survey by helicopter during freeze-up to inventory, video and photograph to identify additional seeps in the general area of northwest Richards Island. The largest concentration of seeps in the surveyed area was in an unnamed lake to the northwest of Camp Farewell where at least 100 small gas seeps were identified.

With each trip to the field, the researchers make significant progress in the understanding of the discharge rates and distribution of gas seeps in the outer Delta area. They look forward to continuing this work in 2008 with a focus of determining the origin of the gas being discharged. A manuscript as been submitted to the Ninth International Permafrost Conference to be held in Fairbanks in July 2008. Results of this work have also been presented at GAC-MAC in Yellowknife (May 2007).

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File No: 12 404 682 **Licence No:** 14223
Region: GW, SA **Location:** On the Peel Plateau and Plain region.

Regional Geoscience Studies and Petroleum Potential of the Peel Plateau and Plain, Northwest Territories & Yukon
This four-year project (2005-2009) is a collaborative study by the Northwest Territories Geoscience Office, Yukon Geological Survey, and Geological Survey of Canada. The project objective is to improve knowledge of regional geology, including stratigraphic relationships, depositional and tectonic histories, basin evolution, and petroleum potential. The study area has widespread hydrocarbon potential yet is under-explored and its geological history is poorly understood. New geological knowledge in the north is necessary to stimulate petroleum exploration, industry investment, and economic development for the benefit of Northerners.

In the summer of 2007, geological field work continued in stratigraphic sections (layered rocks) exposed along ridges at the northern front of the Mackenzie Mountains, in uplifted areas within the Interior Plain, and along river valleys and

canyons. The work was helicopter-supported and involved several government geologists and university students. Several different formations were studied, measured, photographed and sampled for various geochemical analyses; these formations are of interest for their petroleum potential, either as hydrocarbon source rocks, or as reservoir rocks. For detailed descriptions of ongoing research see: www.nwtgeoscience.ca/petroleum/PeelPlateau.html.

Social Science

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File No: 12 410 694 **Licence No:** 14173
Region: IN **Location:** Within the municipal bounds of Tuktoyaktuk

Building adaptive capacity in an Inuvialuit community: learning to deal with environmental change
Community-based research (interviews and participant observation) in Tuktoyaktuk sought to document past and current stresses experienced by the community and the ways that people are dealing with those stresses. The main objective of the research was to understand sensitivities of the community to climatic change in light of ongoing socio-economic and environmental changes.

Existing stresses faced by residents of Tuktoyaktuk relate to food quality, loss of traditional knowledge, inancial security, and risks to infrastructure (buildings and roads). Taking into consideration predicted intensification of climate change impacts and the proposed Mackenzie Valley Pipeline, the community is expected to undergo significant physical and socio-economic changes. Whereas the ability of some individuals and families to adjust to these changes is facilitated by their ability to take advantage of opportunities in both subsistence harvesting and the wage economy, others are constrained by limited interest in subsistence harvesting, inconsistent employment, lack of sufficient education or training, or substance abuse. It is evident that policies and programs aimed at building skills for employment and subsistence harvesting are necessary for ensuring that residents of Tuktoyaktuk are able to face future challenges. At a community-wide level, it is important for the Hamlet and territorial government to have plans in place for responding to risks from continued coastal erosion.

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Region: IN, GW **Location:** Inuvik, Tsiigehtchic and Fort McPherson

Arctic Gardens- Voices from an Abundant Land
The Arctic region of Alaska and western Canada is known for its abundant energy resources and wildlife species, but the area cannot be understood simply as a disembodied collection of environmental and economic issues. This region is also home to an abundance of cultures and distinctive voices including those of the Gwich'in and Inuit (Inuvialluit and Inupiat), oil workers, recreationalists, and others who make their home in or visit this oft-politicized place.

Seventeen interviews were conducted related to: hunting; fishing; old life ways; observations of environmental change; modern day living; hopes for the future, and individual concerns in villages today. Information was collected from with both permanent residents and visitors to the region and the authors of this collection aim to comply them in

book form. The researchers are exploring publishing the book in an online format and using modern technology such as Participatory Geographical Information Systems in order to incorporate maps, audio, and possibly video into the project.

Follow-up interviews will continue in 2008.

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File No: 12 410 706 **Licence No:** 14211
Region: IN, GW, NS **Location:** Inuvik, Tuktoyaktuk, and Yellowknife.

Impacts of Climate Change on the Availablilty of Gravel in the Inuvialuit Settlement Region, NWT
In the face of a changing physical environment, this study aims to identify and assess the impacts that climate change will have on the availability of and demand for granular resources in the Inuvialuit Settlement Region (ISR). Research in 2007 included a field visit to Inuvik and Tuktoyaktuk, during which a familiarization with the area and granular resource processes was gained, stakeholders were identified, and some stakeholders were interviewed.

The interviews that took place served the purpose of gaining information about how granular resources are extracted, used and managed within the ISR. This information will be crucial in assessing the impacts that a warming climate may have on the ability of ISR communities to obtain gravel and meet community demands in the future. Another vital component of the interviews was gaining a perspective of what concerns there are for granular resources in the future. Stakeholders interviewed have included granular resource managers, construction companies, and competitors for granular resources.

The research for this project will be continued in 2008, during which time more interviews will take place, and the project will be concluded. The final report will aim to identify potential community vulnerabilities related to granular resources, taking into consideration the prospect of a changing environment, as well as ways through which communities may be required to adapt the management of granular resources to these changes. The final report is expected to be available by September, 2008.

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File No: 12 410 698 **Licence No:** 14176
Region: DC, SS **Location:** Schools under the jurisdiction of the South Slave Divisional Education Council

Re-conceptualizing School Improvement: A Transformational Approach
Although decades of concerted efforts and research are available, there remains little in the way of definitive conclusions as to how to improve schools anywhere, let alone schools as far away and exceptional as those found in the South Slave region of the Northwest Territories (NWT) in northern Canada. The day-to-day emergencies and demands of the job of teaching children, coordinating programs, supervising staff and administering a school or region tend to consume staff to the point that they overlook the factors and strategies that can approach and sustain excellence in our schools.

Advocating for a group of eight school principals and seven regional office administrators and program coordinators, this research endeavoured to determine what's really important to school(s) improvement in small and diverse multi-cultural contexts. A participatory action research design and methodology was used to engage these co-participant practitioners together in the 'first person' (I and us) assessment and improvement of their own practices by reviewing and reflecting on school improvement efforts, effective schools correlates, and educational leadership models.

Four key themes emerged from this research in response to the research question and sub-questions: Focus Is Needed; Relationships Matter; Context is Critical; and Servant Leadership Supersedes. In short, context, relationships and focus underpin the other key elements: servant leadership; multi-level alignment; professional

learning communities and assessment.

In the final analysis, this research and the resulting school improvement model provides important insights into 'what works' in school improvement. It contributes to a body of research and has had practical significance locally, improving self and other participants' practice, and encouraging others to use the results of this and further research to improve their own policies and practice for school(s) improvement.

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File No: 12 410 693 **Licence No:** 14152
Region: NS **Location:** Yellowknife, NT (62°27'N 114°21'W).

Nahanni National Park Reserve Expansion: Finding an Equitable Solution
Established in 1976, the boundaries of Nahanni National Park Reserve (NNPR), Northwest Territories protect only a small section of the South Nahanni River watershed. While many have sought to expand the park over the last decade, among them Parks Canada and the Dehcho First Nation, the issue has become contentious given the presence of existing mines and the potential for additional mineral finds in the area.

The researcher studied the proposed expansion of NNPR and explored the merits of a hypothetical amendment to Canada's National Parks Act, which would permit metal mining within national park boundaries. In 2007, the researcher undertook a detailed analysis of existing documentary information and archival records located in Yellowknife. Results suggest that including existing mines and mineral holdings within an expanded NNPR would protect the greatest expanse of territory and could increase collaboration with the mineral industry, leading to improved environmental stewardship and the potential for private sector financial support for the management of NNPR. It is recommended that the proposed amendment be presented to stakeholders involved in the NNPR expansion and, if favored by a majority, the amendment should be tabled to Parliament so that its merits can be debated at the national level.

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File No: 12 410 692 **Licence No:** 14149
Region: SA **Location:** Norman Wells, Deline and Tulita. The researcher for this study will be based in Stockholm, Sweden for the duration of the telephone interviews.

Development of Insider-Outsider Partnerships in the Sahtu
The purpose of this study was to understand the perspectives of resource managers on the impacts of the transition to cooperative resource management in the Sahtu Region. No known studies have been done that compare conditions before and after the transition to co-management. Such a comparison provides a better basis to evaluate whether or not co-management has improved the resource management regime. This study has attempted to fill this gap in knowledge.

Eleven key themes related to manager and harvester relationships emerged from the interviews. Analysis of the themes led to the conclusion that the resource management regime is adaptive, or responsive to change. On the transition to co-management, the study concluded that:

1. The transition to co-management resulted in more bureaucracy. This appears to limit the participation of harvesters and the ability of managers to respond to change.
2. Strong relationships between managers and harvesters appear to have offset the negative affects of bureaucracy. A focus on community engagements, relationship building and problem solving has contributed to making the Sahtu co-management regime adaptive.
3. Relationships, an important form of social capital, are a significant aspect of successful co-management arrangements.

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File No: 12 410 672 **Licence No:** 14235
Region: IN, GW **Location:** Inuvik, Ulukhaktok, Aklavik, Tuktoyaktuk, Paulatuk and Sachs Harbour

Planning for Community Health
The objective of this study was to look at the impact of land use on community health. Land use decisions (such as community design and access to wildlife resources as well as policy and governance structures) can impact health and well-being of community residents. The purpose of this study was to explore those connections in the Inuvialuit region.

The study involved interviews with key informant and experts from the north. The results from the study indicate a strong connection between community health and land use. Promoting and enhancing community health through planning was found to be linked to local governance and control over community and regional affairs, enhanced opportunities for education, economic development that supports the local economy, healing and treatment for individuals, and recreation opportunities that promote personal development.

The implications for planning in the region were that policy should recognize the cultural connection with the land, town lands should be designed to maximize connections with the hinterland, communities should be designed to enhance social support networks, local communities should have control over the planning process, and planning should enhance opportunities for education, jobs and other activities in northern communities.

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File No: 12 410 524 **Licence No:** 14118
Region: IN **Location:** Ulukhaktok

The Influence of Aging, Social Structure, and Money on Subsistence Among Adult Inuit in Two Canadian Communities
During 2007, the researchers conducted and completed fieldwork and data collection in the community of Ulukhaktok. Information about the subsistence hunting and food sharing exchanges was collected among a sample of 15 Inuit households, and additional information was collected about food sharing networks among a larger sample of Ulukhaktomiut.

In the contemporary Arctic, Inuit economies have often been characterized as being “mixed”; that is, Inuit tend to pursue economic strategies that are a combination of both traditional hunting and trapping activities and wage employment in the private and public sectors of the modern village. The work being conducted here is designed to understand how access to money through wage labor constrains or encourages hunting activities. Additional data collection is focusing on social networks in the contemporary community, measuring how hunted food, store foods, and money move between households and throughout the community.

These data are to be compared with data gathered in Clyde River, NU. Data collection is currently underway in Clyde River, and will continue through Spring, 2009. Additionally, data collected from these two communities will also be compared with data collected in both Ulukhaktok and Clyde River between 1992-1994, providing an opportunity to examine changes over time in both communities.

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Region: NS **Location:** Yellowknife

Aboriginal Recruitment and Retention Strategy
No research was pursued under this licence.

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Region: SA **Location:** Radili'ko (Fort Good Hope)

Sustainability's Paradox: Petro-Capitalism, Climate Change and Well-Being in Northern Communities
This research looks into the impacts of climate change and oil and gas development on community health and well-being using youth as the principal investigators. It is important to understand these impacts so communities can plan for the future. A goal of this project is to establish a well-trained Youth Video Research Team in Fort Good Hope that can serve the community to create positive community change through learning from and working with each other.

Three group discussions/community teas where hosted to determine the direction of the project and the questions and issues that where important to people around oil and gas, climate change and health. Youth were then trained on professional video cameras, recording hand-games and drumming. This Youth Video Research Team started interviews in the community and well as recording themselves about the process of doing research from a Sahtu Got'ine perspective. During their interviews, the team heard many important messages about taking care of the land and observations about climate change.

In one interview an elder suggested that the young women need to learn traditional skills in order to know and respect the land. The team started a moose hide tanning to moccasin project and recorded both interviews and teachings while working on the hide. This part of the project investigates how traditional skills teach youth skills for the future and why it is important to learn these skills.

Future research will include going on the land, partnering with the Elder’s council for a youth vision week.

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File No: 12 410 690 **Licence No:** 14119
Region: NS **Location:** Diavik Diamond Mine, Ekati Mine, and within the municipalities of Yellowknife, Behchoko, Wekweti, Wha Ti and Gameti

Negotiated Spaces: Work, Home and Relationships in the Dene Diamond Economy
This research examines Dene engagement with the diamond mining economy in Canada’s Northwest Territories. The possibility of self determination and the potential to be in relationships of reciprocity are found to be fundamental drivers of community health and thus resilience. New relationships with mining companies are entered with the expectation of equal exchange on many levels by communities, so that the exchanges are economic, social, cultural, spiritual and symbolic. This research outlines this process as it plays out in the mining economy and as it is manifest in spaces of negotiation, each of which invokes social capital and reciprocity. These include negotiations between: diamond mining companies and the communities; government and communities; diamond mining companies and the workers; and miners and their families and communities. Each of these negotiations are vital in creating the possibility of employment and business. However, relationships with the settler government and with Treaty mining companies are constrained. Many of the limitations identified relate to the assumption by settler society of the universality of their particular values, practices and culture. The thesis argues that Treaty mining companies can shift approaches, both in the orientation to relationship and in the implementation of agreements through the lifecycle of the mine.

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Region: IN **Location:** Within the municipal bounds of Tuktoyaktuk

Swimming Against the Mainstream: The NWT Aquatics Program in Tuktoyaktuk, NWT
For this research project, 20 interviews and six weeks of participant observation were conducted in Tuktoytaktuk, Northwest Territories. Three themes concerning lifejacket use by residents in Tuktoyaktuk, NWT emerged through comprehensive data analysis. Firstly, residents largely perceive lifejackets to be inaccessible in Tuktoyaktuk. Secondly, wearing a lifejacket was not perceived to prevent drowning; therefore, it was not perceived to be essential to have when riding in or on a watercraft. Lastly, because lifejackets are deemed as non-essential safety equipment and are not perceived to prevent drowning, residents reported that they are not encouraged to wear lifejackets by peers and role models. Providing lifejackets free of charge, encouraging Elders to encourage lifejacket use, and clarifying the role the lifejackets can play in the prevention of injury and death were all identified as ways to promote lifejacket use.

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Region: DC **Location:** Hay River and Hay River Reserve

The NWT Aquatics Program: A Case Study of Leadership Development
This research study examined the Northwest Territories Aquatics Program in the Town of Hay River and K'atlodeeche/Hay River Reserve. For the first six weeks Davina Rousell, (Dr. Giles's MA student) worked along side other lifeguards at the swimming pool in the Town of Hay River. This phase of the research found that individuals in leadership positions used a certain leadership style to promote exclusion and to excuse institutional racism in an aquatic environment. In addition, many staff members were promoting an excessively authoritarian leadership style that caused rule-breaking behaviour from the Aboriginal youth who were using the facility. The second phase of the research project was conducted in K'atlodeeche/Hay River Reserve where the researcher spent an additional six weeks volunteering with the Summer Day Camp. This phase of the study found that Dene women were informal leaders, whereas men were formal leaders. The division between who was an informal or formal leader was traced back to colonial notions of leadership that were founded on hierarchy, patriarchy and paternalistic discourses. The study found that individual, informational and programming as well as cultural barriers were impeding local Aboriginal women from attaining certification as a lifeguard/aquatic leader who could then run the Summer Day Camp.

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Region: DC **Location:** Yellowknife

Swimming Against the Mainstream: Shallow Water Pool Certification
The Northwest Territories Recreation and Parks Association facilitated the piloting of a new lifeguarding qualification: the Shallow Water Pool Lifeguard certification, which is the shallow water equivalent of the National Lifeguard Service award. This certification was created in collaboration with the Lifesaving Society of Canada's Alberta branch in order to attempt to meet NWT communities' needs for certified local staff for shallow water swimming pools.

Participant observation was conducted at the Ruth Inch Memorial Pool in Yellowknife, NWT. Eight NWT residents, one resident of Nunavut, and the four instructors/examiners (three of whom were residents of the NWT) participated in the research project by agreeing to be observed and by participating in semi-structured interviews.

Research findings suggest that there may be benefits to be accrued from conducting the course at a shallow water

pool in the future. Participants believed that it was very important for NWT swimming pools to be run by local (and some specified Aboriginal) residents. Participants further stated that the course would prepare them to be role models, which in turn would encourage other NWT residents to become lifeguards.

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Region: NS **Location:** Yellowknife, NT

Aboriginal Governance: Administrative Decision-Making in the Mackenzie Valley
The main objective of this research is to examine resource decision-making in the Mackenzie Valley. In particular, this research questions whether the legal treatment of co-management boards as similar to other administrative boards overlooks the significance of such institutions. The researcher proposed to conduct interviews of board members on the Mackenzie Valley Environmental Impact Review Board. Interviews were conducted in November 2007. Interviews were recorded and a field journal was maintained. Transcription of interviews is currently being completed and the data resulting from those interviews is currently being analyzed. Drafts for publication are in progress and will be sent to the Mackenzie Valley Environmental Impact Review Board by the end of the calendar year 2008.

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File No: 12 410 696 **Licence No:** 14160
Region: IN, GW, SA, DC, **Location:** Research participants are members of the Association of Social NS,SS Workers of Northern Canada who practice throughout the NWT.

Subjective Well Being and Social Workers within a Canadian Northern Context
This study will ultimately allow the researchers to determine the factors that have the greatest impact on the subjective well being (SWB) of practicing social workers in northern communities, and develop recommendations for both the individual social worker and the employer that are likely to enhance SWB in social workers. A survey assessing subjective well being amongst NWT social workers was distributed in 2007, and the research licence has been extended in the 2008 period. The work is in progress.

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Region: NS **Location:** Yellowknife, NWT

Assessing the Diamond Exploration and Staking Process in Canada's North
This research project investigates access to and control over minerals in the Northwest Territories (NWT) and is based on research conducted in Yellowknife in the summer of 2007. It examines government and industry involvement in the mineral exploration process, through an analysis of attitudes about the legal framework formerly referred to as the Canadian Mining Regulations. These mineral regulations determine the exploration process, and are guided by the historically based assumption that mining is the highest and best use of the land. This assumption is practiced under the free-entry principle. Under this principle minerals can be staked without consultation with communities in areas where there are unsettled land claims. Consultation is encouraged by government, but not required and this leads to conflict, both in the NWT as well as in other parts of Canada. The minerals industry generally argues that free-entry is the best way to govern staking procedures. However, this view is being increasingly challenged. If and when the free-entry principle is challenged, questions of land and mineral rights arise,

particularly during the onset of exploration ventures in areas of unsettled land claims. This project therefore examines the mineral staking regulatory environment with a focus on the process active in the Northwest Territories.

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Region: NS **Location:** Dettah and Yellowknife

Acoustics of Nasal Vowels in Yellowknife Dogrib and Chipewyan

The purpose of this project was to see how nasal vowels are pronounced in Dogrib (Tłı̨chǫ Yatıì) and Chipewyan (Dëne Sųłıné), as spoken by the Yellowknives Dene. Nasal vowels are pronounced with air flowing through the nose as well as the mouth, and are written with a hook under them— *a̧, ȩ, ı̧, o̧, u̧*. Because, with nasal vowels, the nasal cavity is resonating as well as the vocal tract, these vowels are harder to hear clearly. The hypothesis was that nasal vowels are pronounced farther apart from each other, to make the sound more clear.

Speakers of Dogrib and Chipewyan pronounced examples of words containing all of the different oral and nasal vowels, and these were analyzed in a computer program called *Praa*t. The result was that nasal vowels seem to occupy roughly the same vowel space as oral vowels: when pronouncing *a̧*, for example, the tongue is in virtually the same position as for *a*, except the nasal cavity is resonating as well.

One interesting finding is that the Weledeh dialect of Dogrib (that is, the dialect spoken by the Yellowknives Dene) still preserves the vowels *u* and *u̧*, just like Chipewyan, but unlike other Dogrib dialects, for example in the words *sheku* 'boy' and *hu̧ka* 'rocky outcrop overlooking a river'. This is something to take into consideration in the future, in making language teaching materials for the community.

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Region: NS, SS **Location:** Yellowknife, possibly other locations where Bathurst Caribou Mngt. Plan. Committee and Beverly and Qamanirjuaq Caribou Management Board representatives work.

The Impacts of Caribou Co-management Arrangements on Development Activities in Caribou Habitat

The researchers have been studying how interactions between caribou management arrangements and other organizations have influenced efforts to conserve caribou and caribou habitat that is under industrialization pressure. Most of the work has focused on the Beverly and Qamanirjuaq Caribou Management Board (BQCMB). The researchers have attended 3 board meetings and conducted open-ended interviews with several of the board members. In addition, some data was collected in Yellowknife on Bathurst caribou management processes. This information was collected for comparative purposes and included semi-directed interviews with several government employees and employees of a renewable resource management board.

Preliminary results suggest interactions between boards, organizations, and government agencies have significantly affected the BQCMB's initiatives to conserve caribou habitat. The researchers are currently analyzing the outcomes of different styles of interacting. This research should assist board members in making decisions about the types of interaction they might pursue in order to achieve specific objectives.

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Region: GW **Location:** Fort McPherson

Gwich'in Traditional Food for Health
The intent of this research was to create sustainable community-driven activities that will improve the diet of the community. The main questions were: Can the diet be improved over a 2 year program? What is the impact on the health of the community? What activities can be implemented that will enhance use of traditional food? What activities will improve accessibility and use of good quality market food, particularly fruits, vegetables and dairy products? What activities will reduce demand for low nutrient, and sugary foods, particularly by children?

The research team worked with three CINE nutritionists during February and March, 2007 to conduct “before” measures of food intake and overall health using diet and health questionnaires and body measures of blood pressure, height, weight, waist circumference and body composition in women 20-40 years of age and children 10-12 years of age. Participation rates were 62% for women and 77% for children. Preliminary analyses of data indicate that physical activity could be improved in both women and children and traditional foods and healthy purchased foods should be encouraged to improve quality of food consumed.

Intervention activities, initiated after this assessment and are ongoing, have included: development of a recipe book based on local foods; physical activity program for women and; healthy eating in school (“Drop the Pop NWT Challenge”, traditional food cookout, field trip to gather edible plants).

In August, two community members attended the CINE/McGill case study partners meeting in Montreal. This was an opportunity to learn about interventions conducted by the other eleven case studies, and to gather new ideas from colleagues in other communities.

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Region: NS **Location:** Yellowknife

Assessing the Effectiveness of Impact and Benefit Agreements in the Canadian North
Impact and Benefit Agreements (IBA) are increasingly being signed in Canada’s mining sector between mining firms and aboriginal communities near resource development projects. As part of a larger project, this research sought to assess the effectiveness of three IBAs from the perspective of one of their aboriginal signatories – the North Slave Metis Alliance (NSMA). In combination with more general participant observation, four focus group meetings were organized in the summer of 2007 in Yellowknife, NT with members of the NSMA. The results indicate that, overall, the NSMA believe that their IBAs have provided benefits to the community through jobs, skills, and other opportunities. Members also appear to believe that these benefits are helping to relieve some of the capacity issues within their community, particularly for youth. However, community members displayed a lack of trust of mining firms and believe they have little influence in decisions regarding mining development in the region. More generally members expressed a desire to be more involved in IBA negotiations and implementation. This is understandable as it was evident that community members lacked specific knowledge of their agreements as a result of limited communication regarding their IBAs and especially community entitlements.

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Region: GW, SA, DC, NS, SS **Location:** Yellowknife

Encouraging Women's Narratives in the Northwest Territories - A Source of Hope for the Future
This research is a critical examination of the lives and future of women in the Northwest Territories. The researcher conducted conversations with 23 indigenous and non-indigenous women active on social justice and women’s issues in the NWT. The conversations covers the solitudes, isolation, and vulnerability of northern women. These

circumstances characterized the colonial past and, through the increased presence of global resource industries, become entrenched as the future. Northern women seek security, safety, and equality but the fast and efficient forces of global resource industries contribute to attitudes that diminish women and their interests. Given the existing uneven circulation of power in gender and racial relations, northern women must be courageous, conscious, curious, and connected in order to secure an equal and valued place in the NWT in the 21st century. Northern women take hope for the future from exceptionally skilled and determined indigenous women, the power of stories, and the potential to erase old boundaries, work together and support each other to manage the effects of global resource industries. The research points to opportunities for women in every sphere of society and stories are a conduit for women to work together to capture these opportunities.

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A Resilience Analysis of Institutional Involvement in Mitigation of the Social Impacts of the Mackenzie Gas Project

The proposed Mackenzie Gas Project (MGP) will not only bring training and employment benefits to the NWT, but may also increase problems for people already suffering from poor health and wellbeing. The purpose of this project was to examine how groups and organisations operating in Inuvik were preparing to address the projected social impacts of the MGP. Data were collected through interviewing representatives from a variety of public and private groups working in areas of education, health, government, business, and advocacy, as well as information prepared by different participants involved in the MGP hearing process.

Results indicate some of the health, wellness, and housing organisations do not have enough money or staff to cope with existing problems as well as potential impacts. Some helpful steps have been taken to provide more resources, such as an impact fund and Socio-Economic Agreement. However, the funding may arrive too late to fully prepare the proposed mitigation measures. Findings also suggest there are problems with communication across different levels and sizes of organisation. These issues may reduce the capacity of the community to address the social impacts.

However, participants also voiced firm confidence in the capacity of community members to adapt to these challenges, based on the community's experience with past issues.

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Region: DC, NS, SS **Location:** Gameti, Wati, Behchoko, Wekweeti, Dettah, N'dilo, Yellowknife, LutselK'e, Fort Resolution, Fort Smith, Hay River, Hay River Reserve, Enterprise, Fort Providence

Gacho Kué Project - De Beers

Following the release of the Draft Terms of Reference, De Beers's senior management and consultant team visited seven NWT communities to introduce the Gahcho Kué engagement process, and secure support for socio-economic studies and community engagement as per the requirements of the Environmental Impact Assessment Guidelines.

The Community Engagement consisted of two parts; a series of community meetings led by De Beers to refresh the public's memory about the Gahcho Kué Mine Project, a series of meetings led by AECOM Canada (formerly Gartner Lee Limited) environmental and socio-economic consultants to discuss the Project with communities, and non-governmental organizations, to obtain their views on potential effects of the mine and how these might be mitigated.

Familiar community issues and concerns emerged from the engagement process which will guide further development of the Key Lines of Inquiry and Subjects of Note for the final Environmental Impact Assessment. The issues of local concern tended to involve potential impacts of the mining operation upon caribou calving grounds and their migration, the roots of social disparity (which is perceived by the community to be increasing), substance abuse, strain on the family unit, and opportunities the mine holds for training, education and promotion of local people.

The objective of Socio-Economic Studies in Support of the Environmental Impact Studies Engagement Program was to conduct socio-economic interviews with Indigenous community leadership, SAOs and community directors to fill the gaps in the baseline knowledge of existing socio-economic conditions in the NWT. This knowledge will assist with the design and execution of cumulative effects mitigation once the mine is near the end of its life cycle.

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Codes and Standards and Climate Change Adaptation in the Canadian North
The objectives of this research was to examine how codes and standards could be used to help facilitate adaptation to the future consequences of climate change on built infrastructure in Canada's north. The research approach was to investigate climate change risk from the perspectives of both the present and future generations when considering infrastructure planning, design, engineering and use. It involved completing a literature review, undertaking key informant interviews, and a workshop where key stakeholders came together to dialogue on the challenges facing built infrastructure in the north as a result of climate change.

A number of potential areas for policy reform were put forward:

1. To improve understanding of the costs and benefits of adapting to climate change;
2. To include Northerners in developing the climate and permafrost data used in the application of codes and standards;
3. To improve information on the rate and extent of permafrost degradation in the north;
4. To realign climate design values so that they reflect present as well as future risks;
5. To improve monitoring of the rate of climate change in the Arctic;
6. To expand the scope of codes and standards so that they require users to assess fuller life cycle costs.

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Landscapes of Power: Native Peoples, National Parks, and the Making of a Modern Wilderness in Northern Canada and Alaska, 1940-2000
The main goal of this dissertation project is to assess how aboriginal peoples have influenced the management of national parks and other protected areas in northern Canada and Alaska during the second half of the twentieth century. Investigations of historical events are being conducted at three locations: (1) Kluane National Park and Preserve in the Southwest Yukon; (2) Gates of the Arctic National Park in Alaska, and; (3) Ivvavik National Park in the northern Yukon. During the summer of 2007, the researcher examined archival materials held at document repositories in Inuvik, Northwest Territories, and Whitehorse, Yukon, in order to reconstruct the history of protected areas management in the Inuvialuit Settlement Region. In addition, he conducted sixteen face-to-face and telephone interviews with national park managers, aboriginal leaders, and other knowledgeable individuals about the events under examination. These research activities were supplemented by archival study at the National Archives of Canada in Ottawa and the Wilfrid Laurier University Archives in Waterloo, Ontario, where important documentary records on northern conservation are held. Historical materials collected by the researcher are currently being used to write four dissertation chapters.

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People, Land, and Pipelines: Perspectives of Resource Decision-Making Processes in the Sahtu Region, Northwest Territories
This doctoral research looked at the ways in which people in the Sahtu are participating in decisions and activities related to oil and gas activities on their lands. As part of this research, the researcher attended a series of Joint Review Panel (JRP) community hearings held in the Sahtu Region in 2006. In 2006 and 2007 ethnographic fieldwork were also conducted in Déline, Tulit'a, and Colville Lake. The main research methods included talking with people in the communities, interviews with community members including community leadership and Elders, attendance at MGP public and review hearings, and focus groups. Preliminary findings suggest that there are several barriers to Sahtu Dene and Métis participation in the assessment and regulation of oil and gas activities in the Sahtu including: differing perceptions of oil and gas impacts and consequences between local people and large corporations; the technical and legal nature of environmental assessment and regulatory processes; and, differing communicative practices and norms of appropriate human interaction with the environment. Changing governance structures resulting from the Sahtu Dene and Métis Comprehensive Land Claim also influence how and when people are able to participate in decision-making processes. Despite considerable challenges to Sahtu Dene and Métis participation in oil and gas assessment and regulation, there is a growing emphasis on establishing oil and gas economies from within the Sahtu Region. Some local people are interested in procuring contracts for Sahtu businesses, creating sustainable employment for young people, and negotiating social and economic capital. However, preliminary findings in all three Sahtu communities overwhelmingly indicate that maintaining a land-based subsistence economy is of paramount importance for people in the Sahtu. Factors such as perceptions of costs and benefits relative to the location of the proposed project, and ownership of sub-surface rights, can influence the ways in which oil and gas activities and assessment are experienced at the local level. Overall, this research contributes to an understanding of the effects of non-renewable resource exploitation and assessment in the Canadian north, and will document how effectively Aboriginal peoples' views about impacts stemming from non-renewable resource extraction are considered within regulatory and environmental assessment processes.

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People, Land, and Pipelines: Perspectives of Resource Decision-Making Processes in the Sahtu Region, Northwest Territories
See Licence #14103 by Carly McLafferty for this summary.

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Region: IN, GW **Location:** Inuvik

Disaster Management and Climate Change Adaptation in the Canadian North
This project was part of the Climate Change Adaptation Policy Program that was launched by the National Round Table on the Environment and the Economy in June 2006.

The anticipated impacts of climate change of greatest concern include permafrost degradation, increased snow and ice loading, loss of sea ice, coastal erosion, increased risk of forest fires, increasing freeze/thaw cycles and increased frequency/intensity of extreme weather events. Climate change and emergency management come together at the prevention/mitigation phase where community or regional level adaptation efforts need to be undertaken.

The focus of the study was on physical infrastructure and workshops in each of the territories identified – Transportation, Energy and Utilities, and Communications and Information Technology – as critical for the continued

delivery of core services during an emergency. This was followed up with a sector analysis group discussion to explore potential policy options and other approaches for mainstreaming climate change adaptation with emergency management.

Recommendations for action to be taken by the Government of Canada include: critical infrastructure identification and analysis; awareness, education, training and capacity building; research and monitoring; and, review of the accountability framework for climate change adaptation and emergency management. Such recommendations need to be implemented if the economic and social development, governance, environmental protection and sovereignty priorities are to be met in a sustainable manner.

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Region: NS **Location:** Yellowknife, NT

A Diamond in the Rough: The Constraints and Opportunities for Diamond Tourism in Yellowknife, NWT
During the spring and fall of 2007, 4 focus groups and 18 interviews were conducted in Yellowknife on the constraints and opportunities of diamond tourism. In total there were 20 participants from the tourism and mining industry; municipal and territorial governments. Under the categories constraints and opportunities there were three sub-categories for each: physical; social; and political. The physical constraints included: security, distance from the mines, lack of access and infrastructure, the Yellowknife airport and flights, lack of themeing, and lack of visual displays. Social constraints included: labour shortages, failed initiatives in the past, lack of education on the benefits of tourism, and a booming economy. Political constraints included: lack of marketing and research, limited support from government, Destination Marketing Organizations and mines, and limited funding. Physical opportunities included: video presentation; advance infrastructure; adding diamonds to art; packaged tours; marketing; and mining/heritage tourism. Social opportunities included: corporate tourism, partnerships, packaging, and tourism diversification. Political opportunities included: diversifying the tourism supply package, adding a feminine product, and adding diamond tourism to the tourism strategy. A final report is available through the Northern Frontier Visitor Association in Yellowknife.

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Region: IN, GW, SA, DC, NS, SS **Location:** Aurora College campuses in Fort Smith, Yellowknife and Inuvik

Science and Research Education in the NWT: Postsecondary Perspectives
The International Polar Year provides an opportunity to reflect on northern science and research. For all Canadians, science and research should contribute to living a good life. A good life includes successfully making sense of the world within local contexts, sharing this knowledge beyond the immediate community and reconciling it with knowledge held by outsiders. Northern science and research are inherent in Traditional Dene, Inuvialuit and Métis knowledge; and they continue to be reflected in northern governance, economy, and cultures. Along side aboriginal sciences are western sciences; these are primarily disciplinary in nature and they formally structure education globally. Postsecondary science and research education is still being introduced to the Northwest Territories. Over the last forty years, the territorial government has developed the capacity for educational services, funding, institutions, and authority through the Department of Education, Culture and Employment. The delivery of northern-based postsecondary education through Aurora College provides northerners with the capacity to generate science and research in the North. What place do science and research have in the North? What kinds of investments need to be made and will northerners be prepared to overcome barriers and take advantage of the opportunities?

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File No: 12 410 695 **Licence No:** 14159
Region: DC **Location:** In the communities of Fort Liard (Acho Koe), Fort Simpson (Liidlii Kue) and Trout Lake (Sambaa K'e).

Comparative assessment of cumulative impacts on Aboriginal cultural practice: A longitudinal study in the Deh Cho Region
Given the current development context in the NWT and the call for improved data collection pertaining to social and cultural well-being, this project objectives were three fold: (1) Assess current Aboriginal cultural practices with respect to Aboriginal language use, country food harvest, and other practices; (2) Compare current levels of Aboriginal cultural practices with earlier research (e.g., Fort Liard country food study in 1995 conducted by Natural Resource Canada); (3) Using comparative case study methods, anticipate future impacts on Aboriginal cultural practices from industrial development.

How will communities maintain their use of the land as more people are affected by industrial development? The NWT Environmental Audit 2005 identifies a need to monitor changes in Aboriginal language, changes in Aboriginal cultural practices, and other traditional activities. The Deh Cho Land Use Plan also notes that "protection of Dene culture and traditional land use is the highest priority of Deh Cho First Nations members." In order to understand the relationship between resource development, wage employment, and the protection of Dene culture and traditional land use, research is needed to establish baseline levels of cultural practice and land use. Where baseline information already exists, on-going research can help understand key trends.

This research added to this baseline information through a houshold a suvey within three Deh Cho First Nations. Before the survey is administered, a workshop was held in each community, where community members will confirm and agree to the content of the questionnaire.

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File No: 12 410 650 **Licence No:** 14120
Region: IN **Location:** Within the municipal bounds of Ulukhaktok

Combining Two Worlds: Inuvialuit Youth Research with Elders and Southern Scientists
This research involved youth in Ulukhaktok as researchers to develop an understanding of how changes in the community together with climate change are affecting arctic communities, specifically for younger generations. Research in the community was led by 11 community youth researchers. The research team conducted 4 focus groups and 6 mapping exercises with youth in the community. A total of 52 (27 male; 25 female) youth between the ages 8 and 24 years old participated in the research.

Preliminary findings show that youth in Ulukhaktok continue to have a strong relationship with the land and subsistence harvesting is important to youth socially, culturally and for health and wellness. Youth report that they are sensitive to climatic changes that together with economic and educational factors are affecting their ability to travel and harvest safely and successfully, specifically during the spring months. Youth also documented a number of societal concerns that they have, specifically the quality of their education, drugs and alcohol, opportunities to learn traditional skills, and employment. The project is ongoing and youth researchers are analyzing focus group and mapping data, and researchers plan to conduct follow-up qualitative data collection exercises with the youth participants to provide further insight on these issues.

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File No: 12 410 687 **Licence No:** 14093
Region: NS **Location:** Aurora College (Yellowknife Campus)

Evaluating Student Nurses: An Institutional Ethnography
The 2004 Collaborative Nursing Program Conference revealed that evaluating and making decisions to promote or fail student nurses is wrought with many contradictions that are not well understood. This research was proposed in response to understanding how professional beliefs and practices are embedded into evaluation efforts, and involves a consortium of schools of nursing in British Columbia and the Northwest Territories. The aims of the research centre on exploring the evaluation work of students and instructors in a Bachelor of Science in Nursing (BSN) program to understand how it happens that evaluation efforts seem threatening and adversarial to students and instructors alike in what is purported to be a caring or relational curriculum with formal systems in place to ensure transparency, due process and practice competence. The research employed an Institutional Ethnography (IE) approach.

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File No: 12 410 611 **Licence No:** 14142
Region: IN, GW **Location:** Within the municipal bounds of Inuvik

A Community-Based Participatory Action Research Video-Making Project to Celebrate and Promote Family Literacy in the Western Artic
Education is failing Aboriginal people of the Canadian North and must be understood as a fundamental human right. The Northern educational crisis must be addressed so that all Northerners can attain the necessary literacy and education levels to be able to lead productive lives and to build healthy communities. The dual purpose of this research was to start and to document a community conversation about the role and purpose of literacy and education in a Northern community.

The methodologies of orality, social marketing, decolonization/post colonialism, Aboriginal literacy, holistic literacy and self-efficacy, and community development speak to the need to question the basic purposes of education and literacy, and to dispel the negativity associated with the struggles of Northern Aboriginal people here to achieve goals that are disassociated from their culture and values. Analysis of patterns indicates community desire for education to value Aboriginal history and knowledge, biculturalism, family and community, educational success and increased employability/economic security, and prosperity from education within education and literacy programs in the North.

Outcomes include a need to acknowledge and foster Northern perspectives, voice, and ways of knowing. It also calls for more resources to be developed for the North and in the North. New technology can be a method to try and promote and celebrate education and literacy in the North.

The complete thesis is available at the Aurora Research Institute.

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File No: 12 410 618 **Licence No:** 14241
Region: IN **Location:** Tuktoyaktuk and Inuvik

The Meaning of Education for Inuvialuit Families in Tuktoyaktuk
This case study explored how the meaning of education has changed for the Inuvialuit in the past 80 years. The study was conducted in the Inuvialuit community of Tuktoyaktuk in 2007 and continues into 2008. The qualitative data sources included community participation field notes from three months field work, transcripts from a youth focus group, as well as interviews with key informants and diverse multigenerational families. The study found that in the 1930s for the Inuvialuit learning to speak, read and write English was seen as beneficial, but formal education was not considered a necessity. Instead, it was more important for children to learn “the Inuvialuit way of life”. By the 1970s more parents encouraged their children to continue to junior high school or even high school. Youth that had

more schooling were able to benefit from wage employment, but also enjoy “the Inuvialuit way of life.” In 2007, education was seen an instrument for economic self-sufficiency, opportunity, security and choices. High school graduation was seen as a means to getting a good job, continuing to post-secondary education, and for some a way out of the small remote community. The reasons why this dream has cut short for most of the students is discussed in the light of family, school and community factors.

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Region: IN **Location:** Tuktoyaktuk and Inuvik

A Renewed North: Resources, Corporations and First Nations
In the fall, the researcher along with her research associate, Jessica Simpson (from Wha Ti, NWT) conducted fieldwork under the larger IPY project, GAPS (The Impact of Oil and Gas on Arctic Peoples Using a Multiple Securities Perspective). The researchers conducted a week long meeting process with community representatives and Inuvialuit officials in Tuktoyatuk.

The researcher attended the first-ever all-candidates forum as the NWT territorial election was underway. Jessica hosted a meeting with youth representatives as well as made a presentation to Hamlet officials. Jessica and Gabrielle also were able to interview Nellie Cournoyea who happened to be in town that week. In the end, after 2 ½ weeks of research, the researchers collected over 20 interviews.

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File No: 12 410 800 **Licence No:** 14239
Region: IN, GW, SA, DC, NS, SS **Location:** Project will involve all communities in the Northwest Territories

Mapping the Social Economy in Northern Canada - Northwest Territories Project
This purpose of this project is to develop a comprehensive inventory of social economy organizations that exist in Nunavut, the Northwest Territories, Yukon, Nunavik and Labrador. Social Economy groups are mostly non-profit organizations, including advocacy groups, voluntary organizations and other community-based organizations, including cooperatives. The term “voluntary and community sector” are terms more commonly used in the North. Social economy organizations produce goods and services for members and community with a clear social mission. They put people as priority over capital. Their management is independent of government and workers and/or users use a democratic process for decision making.

In order to get a clear picture of what and how social economy groups operate in these northern territories a questionnaire was developed and distributed by email and mail. The survey is designed to determine the types of activities that organizations are involved with and the number of members/people in these groups. As part of the survey the researchers also ask respondents to list research needs and priorities provided by these organizations in order to guide further research priorities and assist with establishing research partnerships and collaborations. This will assist the program with developing further research projects that address the needs and priorities of northern communities and organizations.

The Social Economy Research Network of Northern Canada will provide information through various written media including regular newsletters, website postings (http://dl1.yukoncollege.yk.ca/sernnoca) with discussion sessions and an intranet site for participating members.

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File No: 12 410 802 **Licence No:** 14257
Region: NS **Location:** Yellowknife - Bellanca Building

Public Service Pride
This study explored how employees of the Communications Directorate of Indian and Northern Affairs Canada Northwest Territories Region find value in providing public service. It also examined how an appreciative and narrative inquiry approach to organizational change can be used to connect the positive energy and momentum that employees feel when doing their very best at work to a positive approach to delivering public service. This research will benefit employees, as they will have the opportunity to develop a positive attitude about their work and their roles as public servants which in turn allows them to grow in their work and have positive, open communication with their colleagues, supervisors and clients about providing public service. This work in turn presents opportunities for communication of shared values and improvement in staff morale. There was a focus on appreciative inquiry models, employee engagement and organizational culture. Some issues that challenged the process were perpetual change management, existing negative attitudes toward public service and a government-wide focus on results.

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File No: 12 410 691 **Licence No:** 14147
Region: DC, NS, SS **Location:** schools within the Deh Cho and South Slave Divisional Education Council, Yellowknife Catholic Schools and Yellowknife Education District No.1

Teaching Writing Using Print, Multimedia and Digital Technologies in Canadian Classrooms
The study looked at ways in which teachers in Grades 4 to 8 address the issues involved in teaching writing in urban and rural schools across Canada. The goal of the research was to determine ways in which educators teach and assess writing, including their use of new technology as they work in the diversity of classroom settings that exist in Canada.

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File No: 12 410 700 **Licence No:** 14180
Region: NS **Location:** Behchoko (Rae-Edzo)

Tłı̨chǫ Yatii Auxiliary Verbs
Working with Mary Siemens of the Tłı̨chǫ Community Services Agency, the researcher compiled a corpus of phrases and sentences containing auxiliary verbs. Preliminary analysis indicates a link between uses of these verbs to indicate tense and to indicate transience (or permanency). The data collected were used in part in the continuing development of the Tłı̨chǫ Yatiì online dictionary, which will form an important part of curricula aimed at revitalization of the Tłı̨chǫ language. Furthermore, this conceptual link between tense and transience is worthy of further investigation and will form the basis for additional research.

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Region: IN **Location:** Community of Ulukhaktok (Holman)

Pitquhiraluavut Puiglimiatavut (We will not forget our ways): Bringing home photographs of the Inuinnait collection at the British Museum
Administrative difficulties around the funding delayed the start of the project to December. An initial meeting of the research team in Ulukhaktok allowed: for the identification of information about two British ships of interest; developing criteria to select elders; identifying Elders to participate in the project; developing a numbering system and format for transcripts.

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File No: 12 410 697 **Licence No:** 14174
Region: GW **Location:** Tsiighethic and area

Arctic Red River Headwaters: Heritage Resources and Traditional Use
With support from the SSHRC, the GRRB, and the Historic Places Initiative of the GNWT, the Gwich'in Social & Cultural Institute conducted a traditional ecological knowledge and initial archaeological survey project about and within the headwaters of the Arctic Red River. The interviews and survey were the third phase of the study, which has also included an extensive literature review and traditional knowledge and traditional use interviews.

Using the TEK interview data, an archaeological assessment was conducted in the headwaters region from August 18th to 28th, 2008. Field crew stayed at the Arctic Red River Outfitters base camp at the mouth of the Arctic Red River, and conducted walking survey of various locations identified by Elders or through archaeological potential assessment. Crew consisted of GSCI contractor Kristi Benson, University of Calgary archaeologist Dr. Brian Kooyman, and archaeological assistant/guide Sonny Blake, of Tsiigehtchic. Shovel tests were excavated where appropriate, although the project focussed on assessing the potential of the area for further heritage work. Numerous axe-cut stump sites were located during survey as well as one possible hearth feature. One axe-cut tree that survived harvest was sampled for examination by a dendrochronologist and yielded a harvest date of around 1830.

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Region: GW, SS **Location:** Fort McPherson and Fort Smith, NWT

Indigenous Ways of Knowing: Aboriginal Women's Experiences with Beadwork
This research was conducted by an Indigenous researcher from the Northwest Territories who examined multiple perspectives concerning Indigenous women's participation in traditional cultural activities. These areas included: beadwork to explore how participation contributes to development, identity formation, formation of teacher/learner relationships, and relationships to social and cultural environments. During 2007, the researcher visited the Pitt Rivers Museum, University of Oxford, to study of a pair of moccasins made by her late grandmother at Fort Smith, Northwest Territories, purchased by the Hudson's Bay Company, and donated to the museum in 1942. Hosting of bi-weekly Aboriginal Women's Beading Circles with urban Aboriginal women in Edmonton, Alberta to document the contribution of beadwork to Aboriginal women's health and well-being remains ongoing during 2008. Travel to Fort Smith and Fort McPherson, Northwest Territories to document Aboriginal women's experiences with beadwork is scheduled. Fieldwork research will be shared through the design and development of a series of digital stories using personal narrative, photographs, audio and participatory video. This study draws our attention to the many contributions of Aboriginal women in the North whose legacy is a rich endowment of materials created and crafted by them from which future generations may continue to learn about Indigenous ways of knowing. Analysis and reflection upon Indigenous ways of teaching and learning may contribute to our understanding of the health and well-being of Indigenous women and Aboriginal people in Canada.

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File No: 12 410 707 **Licence No:** 14226
Region: NS **Location:** in the North Slave region, on three to six locations yet to be selected.

Climate Change Impacts on Canadian Arctic Tundra Ecosystems - Metis Traditional Knowledge Study
The field work component of the research was not completed due to logistical issues. The fieldwork is expected to be completed in the summer of 2008.

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File No: 12 410 708 **Licence No:** 14232
Region: DC, SS **Location:** At and around the Katlodeeche First Nation's Buffalo Lake Community Gathering at the west end of Buffalo Lake.

Woodland Caribou In Wood Buffalo National Park
The goal of the research was to document the Traditional Ecological Knowledge (TEK) of harvesters and elders about woodland caribou (*Rangifer tarandus caribou*) in western Wood Buffalo National Park (WBNP). The current knowledge gap makes it difficult to manage confidently for caribou conservation, and the intent was to enhance understanding of the species and contribute to effective caribou management.

The methodology of this qualitative research was based on principles of action research. Individual, semi-directive interviews were conducted with 10 people from the K´átł'odeeche First Nation (KFN), based near Hay River, NWT, and nine members of Little Red River Cree Nation and Mikisew Cree First Nation, both of which are based in northern Alberta. The KFN interviews were conducted as part of KFN's cultural documentation process, and four of the KFN elders were also interviewed as a group during a five-day cultural documentation trip to the Buffalo Lake area. The 19 participants were between 49 and 90.

Participants identified and described the locations of woodland caribou sightings and also reported sightings of barren-ground caribou. Population dynamics, the personal and cultural significance of woodland caribou, and resource management issues were also discussed. Results are still being assessed and the thesis is in progress.

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File No: 12 410 495 **Licence No:** 14184
Region: GW **Location:** Gwich'in Tribal Council camp on the Mackenzie River, approximately 8 miles south-east of Inuvik

The Dene Moose Hide Tanning Project
This project brought together ten people to learn how to tan moose hides according to the Dene hand tanning method. The camp took place during the last two weeks of June 2007, instructed by Elders Mary Barnaby and Judy Lafferty of Fort Good Hope. The purpose of the camp was to transmit Dene knowledge of moose hide tanning among participants; analyze the nature of the embodiment of Dene knowledge among participants; and vitalize the practice and knowledge of moose hide tanning among the Gwich'in women of the area. Documentation of the project and its findings exists primarily in the knowledge transmission and embodiment among participants – instead of producing a study or report as its primary goal, the research increased the pool of knowledge among participants, and increased the pool of knowledge holders in the community. One of the purposes of the research was to take an anti-colonial approach to the research methodology, which saw Dene women leading the research and embodying results as technical and cultural knowledge; the project generating a greater pool of knowledge holders and increasing knowledge among the participants; and in so doing create a network of Dene knowledge holders who can work to support each other and their tanning activities, and increase their leadership role in research initiatives. In this sense the research approach modeled a new way for researchers to build cultural strength as the basis for research.

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File No: 12 402 790 **Licence No:** 14110
Region: GW **Location:** Richardson Mountains; TK workshops to be held in Aklavik, Inuvik, Tsiighehtchic and Fort McPherson

Dall's Sheep, Grizzly Bears and Wolves interactions in the Gwich'in Settlement Area: Traditional Knowledge and Climate Monitoring
The objectives of this research were four-fold: 1) update and expand important baseline information on Dall's sheep, grizzly bears, and wolves, which will contribute to the revision of grizzly and Dall's sheep management plan; 2) understand the interactions between those species; 3) evaluate the effect of habitat features and climate on those interactions; and 4) document traditional knowledge about Dall's sheep, grizzly bears and wolves in the Richardson Mountains.

To conduct the project, the research team used a multi-disciplinary approach involving: 1) the simultaneous GPS tracking of individuals from the three species; 2) fatty acid signatures and stable isotopes analyses (which will be performed in 2007-2008); 3) field investigation of predation and behavioural observations (2007-2008); 4) habitat mapping using remote sensing and ground truthing; and 5) documentation of Gwich'in Traditional Knowledge through individual interviews and workshops .

The climate monitoring work entailed hiring of two Gwich'in monitors from Aklavik and Fort McPherson (one per community) who conducted snow surveys along a snowmobile route in the northern Richardson Mountains. Every two weeks, they visited the same stations (approximately 30 in total), and measured the snow depth and density at various elevations and in different habitat types. A weather station was also installed on top of the Mount Goodenough, close to already existing forestry equipment. The station recorded temperature, relative humidity, wind speed and direction, and barometric pressure.

The TK section of the project entailed a review of existing documentation on Dall's sheep, grizzly bears and wolves in the Gwich'in Settlement Area (from GRRB and GSCI database). The findings were discussed with the Renewable Resource Councils of Aklavik, Fort McPherson, Tsiigehtchic and Inuvik, and through discussions with these bodies, areas that need further investigation were identified. The research team conducted and recorded interviews with knowledgeable community members.

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File No: 12 410 664 **Licence No:** 14216
Region: GW, IN **Location:** In and around the communities of Fort McPherson and Aklavik.

Rat River Char Traditional Knowledge
The Rat River Char Working Group (includes Aklavik HTC, Aklavik RRC, Fort McPherson RRC, Fisheries Joint Management Committee, Gwich'in Renewable Resource Board, and the Department of Fisheries and Oceans) is a co-management organization whose mandate is to manage Rat River char (Dolly Varden*, Salvelinus malma*). Every year the group meets to review and revise a fishing plan for this population. For some time now, the Working Group has felt that it would like to have a better understanding of the traditional knowledge of Rat River char so that this knowledge may be better incorporated into management plans. In this study, traditional knowledge interviews on Rat River char were undertaken with community members from Aklavik and Fort McPherson. Specifically, four interviews were undertaken in Fort McPherson and two were taken with fishermen from Aklavik. Consent forms were reviewed and signed prior to each interview. Permission was also granted to document each interview with a digital audio recorder. These interviews are currently being transcribed. Each interview transcript will be made available to its respectful interviewee for verification and allow the individual the opportunity to supply additional comments. Copies of all materials from the interviews will be supplied to the Gwich'in Social and Cultural Institute for their records. Upon completion of transcription, a final report will be written and distributed to appropriate organizations.

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File No: 12 410 688 **Licence No:** 14094
Region: SA **Location:** In the vicinity of Fort Good Hope and associated traditional lands

2007 Traditional Knowledge Study in Fort Good Hope
No research was pursued under this licence. Some logicistical organization did occur.

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File No: 12 410 688 **Licence No:** 14101
Region: DC **Location:** On the associated Liidlii K'ue First Nation traditional lands susceptible to potential effects from the Mackenzie Gas Project

2007 Traditional Knowledge Study with the Liidlii K'ue First Nation
No research was pursued under this license.

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File No: 12 410 709 **Licence No:** 14234
Region: IN, GW **Location:** Inuvik, Aklavik, Tsiigehtchic and Fort McPherson.

Traditional Knowledge on Loche
The objective of this research was to document traditional knowledge about loche biology and loche liver condition. Specifically, questions about loche spawning, movements, predator-prey relationships, habitat, historic changes, loche livers and traditional uses of loche. A total of two interviews were conducted which revealed interesting information about loche fishing and biology. But do to logistical issues, this project was not completed. In 2008, funds were granted to transcribe these interviews along with some other interviews undertaken by the Gwich'in Renewable Resource Board. This project may continue in the future.

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Region: SS **Location:** In and around Fort Resolution, NT.

Adapting to Environmental Change in the North: Traditional Knowledge, Social Capital and Adaptive Capacity in the Slave River Delta
No work was pursued under this license.

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File No: 12 410 705 **Licence No:** 14201
Region: GW **Location:** Inuvik, Aklavik, Fort McPherson, and Tsiigehtchic.

Community Perspectives on Changing Caribou Populations: Traditional Knowledge Networks of Gwich'in Caribou Hunters
The goal of the project was to explore traditional ways of respecting caribou while hunting in Ft. McPherson and the extent to which harvesters draw upon local knowledge, traditional knowledge and/or scientific data or other information (ie. from government or media) to make their decisions about where, when and with whom to harvest. Data is being gathered through qualitative interviews with elders aged 60-80 and hunters aged 30-60. Preliminary results show that traditional rules share similarities to government hunting regulations and co-management board regulations. Adherence to traditional rules appears to be influenced by the greater access offered by technology changes such as the Dempster Highway, vehicles, and skidoos as well as other food and income options provided by the grocery store and the wage economy.

A total of three months was spent in the field (July 3 - August 2, 2007, September 19 - November 19, 2007). July was spent talking to various managers and people in Inuvik, learning about the situation and narrowing the research focus. Three short reconnaissance trips were made to Ft. McPherson, with the purpose of introducing the researchers and the project to the community, and setting up contacts for the upcoming research period. 31 interviews were completed with the assistance of Christine Firth, community research assistant. Ten (10) Elders, seventeen (17) hunters, and four (4) others were interviewed.

Wildlife Permits

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Permit No.: 5652
Species Studied: Barren ground caribou, grizzly bear and wolverine, raptors, waterfowl/shorebirds
Region: NS
Location: Diavik wildlife study area, centered around Lac de Gras

2007 Wildlife Monitoring Program for the Diavik Diamond Mine
Program to monitor wildlife within the vicinity of the mine. Objectives are to verity the accuracy of the predicted effected determined in the Environmental Effects Report (Wildlife 1998) and the Comprehensive Study Report (June 1998).

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Permit No.: 4963
Species Studied: Songbirds
Region: DC
Location: Fort Liard Area

Recording songbirds
To conduct research on recording songbirds to determine maximum range at which their songs are audible through recording microphones.

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Permit No.: 5574
Species Studied: General wildlife
Region: NS
Location: Overland Winter Road between Tibbitt Lake and Lockhard Lake

Wildlife presence and habitat in the proposed new winter road study area
To conduct baseline studies on the proposed 2007 seasonal overland winter road project between Tibbitt Lake and Lockhart Lake, located in the North Slave Region of the Northwest Territories.

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Permit No.: 4964
Species Studied: Small mammals
Region: DC, SA, GW, IN
Location: Vicinity of the Enbridge Pipeline

Impacts of Linear Features on Small Mammal Food Resource Usage in the Viccinity of the Enbridge Pipeline

This perrmit was for wildlife capture and research. Live trapped small mammals will be marked for identification to delineate abundance and territorial ranges of individuals.

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Permit No.: 5351 **Species Studied:** Red-throated loon
Region: IN **Location:** Toker Point, Nuvorak Point, Atkinson Point and Western Husky Lakes

The red-throated loon as an indicator of environmental quality
This project records the productivity and abundance of red-throated loons as an indicator of the early ecological effects of offshore oil and gas.

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Permit No.: 5363 **Species Studied:** Thick Billed Murres
Region: IN **Location:** Cape Parry

Photocensus of Cape Parry Thick-Billed Murre Colony

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Permit No.: 3315 **Species Studied:** Polar Bear
Region: IN **Location:** Inuvialuit Settlement Region

Polar Bear Samples Collection

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Permit No.: 3313 **Species Studied:** Wolverine
Region: IN, GW **Location:** Inuvik Region

Wolverine Carcass Collection

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Inuvik, NT X0E 0T0

Permit No.: 3314 **Species Studied:** Wolf
Region: IN, GW **Location:** Inuvik Region (Mainland Only)

Wolf Sample Collection

Branigan, Marsha
ENR - Inuvik Region
Bag Service #1
Inuvik, NT X0E 0T0

Permit No.: 3316 **Species Studied:** Barren ground caribou
Region: IN, GW **Location:** Winter Range of Cape Bathurst and Bluenose-West Caribou Herds

Collaring of Cape-Bathurst and Bluenose-West Barren-Ground Caribou

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Branigan, Marsha
ENR - Inuvik Region
Bag Service #1
Inuvik, NT X0E 0T0

Permit No.: 3317 **Species Studied:** Boreal woodland caribou
Region: GW **Location:** Lower Mackenzie Valley

Ecology of Boreal Woodland Caribou in the Lower Mackenzie Valley

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Branigan, Marsha
ENR - Inuvik Region
Bag Service #1
Inuvik, NT X0E 0T0

Permit No.: 3321 **Species Studied:** Caribou
Region: IN **Location:** Range of the Cape Bathurst and Bluenose East Caribou Herds

Monitoring of Cape Bathurst, Bluenose-West and Tuktoyaktuk Peninsula Barren-Ground Caribou
The objectives of this research are to: 1) obtain current estimates of the recruitment for the Cape Bathurst, and Bluenose-West barren-ground caribou herds and caribou on the Tuktoyaktuk peninsula; and 2) Obtain current estimates of the composition of the Cape Bathurst, and Bluenose-West barren-ground caribou herds.

Branigan, Marsha
ENR - Inuvik Region
Bag Service #1
Inuvik, NT X0E 0T0

Permit No.: 3323 **Species Studied:** Grizzly bear
Region: IN **Location:** West of the Mackenzie Delta

Population Estimates Using DNA Dating for Grizzly bears in the Inuvialuit Settlement Area, West of Delta Eastward
The objectives of this research are to: 1) to provide an accurate and precise estimate of the grizzly bears living in the Inuvialuit Settlement Region in the area east of the Mackenzie Delta; and 2) collect additional reproductive parameter for the population (litter size).

Branigan, Marsha
ENR - Inuvik Region
Bag Service #1
Inuvik, NT X0E 0T0

Permit No.: 5358 **Species Studied:** Caribou
Region: IN **Location:** Cape Bathurst and Tuktoyaktuk Peninsula

2007 Delineation of Calving Grounds of Cape Bathurst, Bluenose-West and Tuktoyaktuk Peninsula Barren-Ground Caribou

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Carriere, Suzanne
ENR Wildlife
600, 5102-50th Street
Yellowknife, NT X1A 3S8

Permit No.: 5631 **Species Studied:** Small mammals
Region: DC, SS, SA, NS, GW, IN **Location:** The complete Territories
Northwest Territories Small Mammal and Hare Survey

Charlwood, Jason
Ducks Unlimited Canada
4921-49th St., Suite 4A
Yellowknife, NT X1A 2P1

Permit No.: 4757 **Species Studied:** Birds

Ecological Assessment on the K'agee Tu Protected Areas Strategy Areas of Interest

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Cooley, Dorothy
Yukon Territorial Government
PO Box 600
Dawson City, YK Y0B 1G0

Permit No.: 3320 **Species Studied:** Porcupine Caribou Herd (*Rangifer tarandus granti*)
Region: GW **Location:** Eagle Plains, Whitefish Lakes, Richardson Mountains west of Fort McPherson/Akalavik

Porcupine Caribou Composition Count and Captures, March 2007

Croft, Bruno
ENR North Slave
PO Box 2668
Yellowknife, NT X1A 2P9

Permit No.: 5628 **Species Studied:** Barren ground caribou
Region: NS, SS **Location:** Vicinity of Behchoko, WhaTi, Gameti, Wekweeti, Detah and Lutsel K'e

Movements of Bathurst Herd
The objectives of this research are to: 1) continue to acquire location data from satellite collars currently deployed on twenty cows from the Bathurst Caribou herd; 2) to relate movements of satellite collared cows to ecological conditions.

Danna, Schock
Detroit Zoological Society
8450 W, 10 Mile Road
Royal Oak, MI 48067
dschock@detroitzoo.org

Permit No.: 5630 **Species Studied:** West toad and wood frog
Region: SA, DC, SS **Location:** South Slave, Deh'cho and Norman Wells' surrounding area

Amphibian monitoring in the Northwest Territories
Conduct surveys for amphibian juviles/morphs, conduct simple disease tests, capture amphibians and track amphibian populations.

Davison, Tracy
ENR - Inuvik Region
Bag Service #1
Inuvik, NT X0E 0T0

Permit No.: 5368 **Species Studied:** Porcupine Caribou Herd
Region: IN, GW **Location:** Inuvik region

Porcupine Caribou Body Condition
Study will monitor body weight, protein and fat of adult caribou over the winter, and will document trends over time; study will investigate the relationship of these trends to other indicators, such as calf survival, herd size and winter range snow depth.

Davison, Tracy
ENR - Inuvik Region
Bag Service #1
Inuvik, NT X0E 0T0

Permit No.: 5366 **Species Studied:** Wolf
Region: IN, GW **Location:** Inuvik region

Wolf Sample Collection
All local hunters will be encouraged to bring in carcasses and to provide information on harvest date and location. Study objectives will be to document age, sex, condition and location of wolf harvests.

Davison, Tracy
ENR - Inuvik Region
Bag Service #1
Inuvik, NT X0E 0T0

Permit No.: 5365 **Species Studied:** Wolverine
Region: IN, GW **Location:** Inuvik region

Wolverine Carcass Collection
Study will document the distribution and level of wolverine harvests in the Inuvik region, and collect genetic material for later DNA analysis to compare wolverine "populations" across the NWT. Study will also assess the age, sex ratios, condition.

Davison, Tracy
ENR - Inuvik Region
Bag Service #1
Inuvik, NT X0E 0T0

Permit No.: 5367 **Species Studied:** Polar Bear
Region: IN, GW **Location:** Inuvik region

Polar Bear Sample Collection
Study with the purpose of determining containment loads of polar bears in the Inuvialuit Settlement Region, and of continuing the collection of samples for diet and DNA analysis.

Derocher, Andrew
University of Alberta
Department of Biological Sciences
Edmonton, AB T6G 2E9
derocher@ualberta.ca

Permit No.: 3322 **Species Studied:** Polar Bear
Region: IN **Location:** Beaufort Sea

Polar Bear Study in the Beaufort Sea
Polar bears, both subadult (2.5 to 4.5 years) and adult females with yearlings, will be caught in the Southern Beaufort Sea (from Herschel Island to Baillie Islands, NWT) will be instrumented with GPS satellite transmitters.

Derocher, Andrew
University of Alberta
Department of Biological Sciences
Edmonton, AB T6G 2E9
derocher@ualberta.ca

Permit No.: 5352 **Species Studied:** Grizzly Bear
Region: IN, GW **Location:** Mackenzie Delta

Ecology of grizzly bears in the Mackenzie Delta oil and gas development area

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Dockrill, Craig
Canadian Wildlife Service
PO Box 1936
Inuvik, NT X0E 0T0

Permit No.: 5361 **Species Studied:** Plants and Migratory Birds

Migratory Bird Habitat and Plant Community Mapping Program.

Egli, Kathi
Yukon Department of Environment
PO Box 2703
Whitehorse, YK Y1A 2C6

Permit No.: 4966 **Species Studied:** Mountain caribou
Region: DC **Location:** South Nahanni

Aerial composition surveys of the South Nahanni mountain caribou population
Aerial composition surveys during the rut, in the Yukon and in the headwaters of the Flat River in the NWT

Ellsworth, Troy
ENR South Slave
PO Box 390
Fort Smith, NT X0E 0P0

Permit No.: 4960 **Species Studied:** Wood bison
Region: DC **Location:** Liard River Valley

Density and distribution of the Nahanni Wood Bison population along the Liard River Valley
To continue ongoing monitoring of population demography, non-invasive sample collection and collection of biological samples from mortalities. In the range of the Nahanni Wood Bison population to a maximum of 18 bison to be collared to document movement.

Evans, Tom
U.S. Fish and Wildlife Service
1011 E Tudor Road MS 341
Anchorage, AK 99503

Permit No.: 5364 **Species Studied:** Polar Bear
Region: IN **Location:** Inuvik coastal region

Aerial Polar Bear Coastal Surveys
Aerial surveys with the purpose of determining the spatial and temporal distribution and abundance of polar bears using coastal habitats and barrier islands during the open water period. Information was gathered, including the number, sex and age classes of the bears.

Ferguson, Carl
U.S. Fish and Wildlife Service
11510 American Holly Drive
Laurel, MD 20708-4002

Permit No.: 5573 **Species Studied:** Duck species
Region: NS **Location:** Stagg River

Banding ducks at Stagg River, North Slave Region

Fronczak, Dave
Migratory Bird Management
1 Federal Drive, Room 501
Fort Snelling, MN 55111-4058

Permit No.: 4758 **Species Studied:** Migratory Birds
Region: DC **Location:** Mills Lake, NT (18 miles NE of Ft. Providence on the Mackenzie River)

Bird Banding at Mills Lake
To conduct bird banding on Mills Lake under Western Canada Cooperative Waterfowl Banding Program.

Goad, Robin
Fortune Minerals Limited
148 Fullarton St. Suite 1902
London, ON N6A 5P3

Permit No.: 5565 **Species Studied:** Caribou, moose, wolverine, wolves, black bear, beavers, muskrats
Region: SA, NS **Location:** Lou Lake

Baseline Wildlife Surveys for the Fortune Minerals NICO project
Document presence, relative abundance and habitat use, to further document wildlife

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Graf, Linda
ConocoPhillips Canada (North) Limited
401-9th Ave. SW,
PO Box 130
Calgary, AB T2P 2H7

Permit No.: 5357 **Species Studied:** Vegetation
Region: IN **Location:** Parsons Lake

Environmental Studies for the Proposed Parsons Lake Development Area 2007 - Vegetation Survey

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Graf, Linda
ConocoPhillips Canada (North) Limited
401-9th Ave. SW,
PO Box 130
Calgary, AB T2P 2H7

Permit No.: 5356 **Species Studied:** Shorebirds
Region: IN **Location:** Parsons Lake

Environmental Studies for the Proposed Parsons Lake Development Area 2007 - Shorebird Survey

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Gurney, Kirsty
University of Saskatchewan
115 Perimeter Road
Saskatoon, SK S7N 0X4

Permit No.: 5653 **Species Studied:** Lesser Scaup
Region: NS. SS **Location:** Ingraham Trail, islands in north arm of Great Slave Lake

Productivity of lesser scaup in Canada's boreal forest
Objectives are to assess spatial and seasonal patterns in the individual quality of lesser scaup ducklings in Canada's boreal forest, and to investigate potential processes responsible for these patterns.

Haszard, Shannon
Ducks Unlimited Canada
4921 49 St, Suite 4A
Yellowknife, NT X1A 2P1

Permit No.: 5632 **Species Studied:** Vegetation
Region: SA, GW, IN **Location:** Mackenzie Valley area and Sahtu

Development of Westland Inventory
To conduct field verification and sampling of various wetland types across the NWT

Haszard, Shannon
Ducks Unlimited
4921 49 St, Suite 4A
Yellowknife, NT X1A 2P1

Permit No.: 5633 **Species Studied:** Vegetation
Region: DC **Location:** Ft. Providence, Kakisa and Jean-Marie River

Development of Wetland Inventory - Taiga Plains Ecozone, NT
To conduct a 2007 roadside wetland inventory.

Hines, Jim
Canadian Wildlife Service
Suite 301, 5204-50th Ave
Yellowknife, NT X1A 1E2

Permit No.: 5570 **Species Studied:** Waterfowl
Region: NS **Location:** North Slave Region

Long-term Monitoring and Research of Waterfowl and Grebe Populations in the North Slave Region
This permit authorizes banding and the extraction of blood from the toenail clipping that will be collected to determine the sex of individual grebes.

Hines, Jim
Canadian Wildlife Service
5204-50th Ave.
Yellowknife, NT X1A 1E2

Permit No.: 5353 **Species Studied:** Swans
Region: IN, GW **Location:** Mackenzie Delta Region

Monitoring cumulative environmental impacts of gas and oil development in the Mackenzie Delta region using Tundra swans as an indicator species

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Hines, Jim
Canadian Wildlife Service
5204-50 Ave., Suite 301
Yellowknife, NT X1A 1E2

Permit No.: 5354 **Species Studied:** Lesser Snow Geese and Brant
Region: IN **Location:** Anderson River Area

Factors causing the declining numbers of Lesser snow geese and brant at Anderson River Bird Sanctuary

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Hines, Jim
Canadian Wildlife Service
Suite 301, 5204-50th Ave.
Yellowknife, NT X1A 1E2

Permit No.: 5355 **Species Studied:** Geese and swans
Region: IN **Location:** Inuvialuit Settlement Region

Population management of geese and swans in the Inuvialuit Settlement Region using aerial surveys and banding studies

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Hines, Jim
Canadian Wildlife Service
Suite 301, 5204-50th Ave.
Yellowknife, NT X1A 1E2

Permit No.: 5360 **Species Studied:** Snow geese
Region: IN **Location:** Inuvialuit Settlement Region

Snow Goose Populations and Habitat Studies in the Inuvialuit Settlement Retion

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Hoos, Richard
EBA Engineering Consultants Ltd.
Oceanic Plaza - 1066 W. Hastings
Vancouver, BC V6E 3X2

Permit No.: 5572 **Species Studied:** General wildlife
Region: NS **Location:** North Slave Region

Environmental baseline studies for Peregrine Diamonds Ltd.

Huebert, Ed
De Beers Canada Mining Inc
300, 5102-50th Ave.
Yellowknife, NT X1A 3S8

Permit No.: 5568 **Species Studied:** Wolf
Region: NS **Location:** Snap Lake

Wolf Den Surveys
The permit extends previous permits to conduct a wolf den survey (known dens and search for new one) beyond the 2 km radium of the mine site to the entire Snap Lake Project Study area.

Hurley, Lisa
Golder Associates
9, 4905-48th Street
Yellowknife, NT X1A 3S3

Permit No.: 5629 **Species Studied:** Caribou, moose, muskoxen, carnivore and raptor
Region: SS **Location:** Gahcho Kue Project near Kennady Lake

2007 Baseline Wildlife Studies - Gahcho Kue Project

Johns, Brian
Canadian Wildlife Service
115 Perimeter Road
Saskatoon, SK S7N 0X4

Permit No.: 4755 **Species Studied:** Whooping crane

The Whooping Crane Ecology and Rehabilitation Sampling Project

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Johnson, Deborah
ENR South Slave
PO Box 900
Fort Smith, NT X0E 0P0

Permit No.: 4751 **Species Studied:** Wood Bison
Region: SS **Location:** Bison Control Area

Conduct surveillance of Bison Control Area
This surveillance will be conducted in the form of shoreline patrols, semi, and comprehensive surveys of the BCA as well as any necessary removal of bison from the BCA.

Johnson, Deborah
ENR South Slave
PO Box 900
Fort Smith, NT X0E 0P0

Permit No.: 4754 **Species Studied:** Woodland Caribou
Region: DC, SS **Location:** Buffalo Lake Area

Boreal Caribou in Buffalo Lake Area
To conduct research activities and sample collection on Boreal Caribou.

Johnson, Deborah
ENR South Slave
PO Box 900
Fort Smith, NT X0E 0P0

Permit No.: 4753 **Species Studied:** Bison
Region: DC, SS **Location:** Mackenzie Bison Sanctuary

Bison population and disease monitoring
Continue to monitor population and disease parameters on bison in the Mackenzie Bison Sanctuary

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Johnson, Vicky
Canadian Wildlife Service
Suite 301 5204-50th Ave.
Yellowknife, NT X1A 1E2

Permit No.: 4962 **Species Studied:** Shorebird
Region: SA, DC, GW IN **Location:** MacKenzie River

Distribution and abundance of shorebird species
To conduct research on distribution and abundance of shorebird species breeding on the proposed pipline corridor and along the Mackenzie river

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Johnson, Deborah
ENR South Slave
PO Box 900
Fort Smith, NT X0E 0P0

Permit No.: 4756 **Species Studied:** Wood bison
Region: SS **Location:** Slave River Lowlands

Wood Bison population and disease parameters Monitoring

Johnson, Deborah
ENR South Slave
PO Box 900
Fort Smith, NT X0E 0P0

Permit No.: 4759 **Species Studied:** Boreal Caribou
Region: SS **Location:** Hay River Lowlands and Cameron Hills area

Research on Boreal Caribou in the Hay River Lowlands and Cameron Hills area

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Johnston, Vicky
Canadian Wildlife Service
Suite 301, 5204-50th Ave.
Yellowknife, NT X1A 1E2
vicky.johnston@ec.gc.ca

Permit No.: 3325 **Species Studied:** Shorebird
Region: IN **Location:** Outer Mackenzie Delta south to the Storm Hills

Arctic Shorebird Monitoring Program

This project is part of a larger program called the Program for Regional and International Shorebird Monitoring (PRISM). The purpose of the program is to: 1) Generate population estimates for all arctic breeding shorebirds; 2) produce maps showing shorebird distribution.

Johnston, Vicky
Canadian Wildlife Service
Suite 301, 5204-50th Ave.
Yellowknife, NT X1A 1E2

Permit No.: 5569 **Species Studied:** Lesser Scaup, Wilson's snipe, Solitary Sandpiper
Region: NS **Location:** Boreal forest

Boreal Shorebird Monitoring Program
This research included: 1)ground surveys to observe shorebird behaviour and determine reliability of the 2) aerial surveys and aerial surveys (helicopter) to estimate and monitor boreal breeding shorebird populations.

Johnston, Vicky
Canadian Wildlife Service
Suite 301, 5204-50th Ave
Yellowknife, NT X1A 1E2

Permit No.: 0 **Species Studied:** Shorebird
Region: IN **Location:** High Arctic Islands

Arctic Shorebird Monitoring Program - High Arctic Islands

Johnston, Vicky
Canadian Wildlife Service
5204-50 Ave, Suite 301
Yellowknife, NT X1A 1E2

Permit No.: 5359 **Species Studied:** Shorebird
Region: IN **Location:** High Arctic

Arctic Shorebird Monitoring Program
This research included an Arctic shorebird survey in the high arctic

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Lambert Koizumi, Catherine
Gwich'in Renewable Resource Board
PO Box 2240
Inuvik, NT X0E 0T0

Permit No.: 3319 **Species Studied:** Barren ground caribou
Region: IN, GW **Location:** Richardson Mountains

Dall's Sheep, Grizzly Bear and Wolf Project in the Richardson Mountains

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Larter, Nic
ENR Deh Cho
PO Box 240
Fort Simpson, NT X0E 0N0

Permit No.: 4958 **Species Studied:** Boreal Woodland Caribou
Region: DC **Location:** Ebbutt Hills Study Area

Satellite/GPS collar deployment on female boreal caribou
To capture and deploy a maximum of 17 collars on boreal woodland caribou. To monitor movements and demography of boreal woodland caribou.

Larter, Nic
ENR Deh Cho
PO Box 240
Fort Simpson, NT X0E 0N0

Permit No.: 4965 **Species Studied:** Moose
Region: DC, SA, GW, IN **Location:** Areas north of the Mackenzie River and areas in the Liard Valley

Monitoring the density and distribution of moose in areas north of the Mackenzie River and areas in the Liard Valley
Collection of biological samples from moose harvested by local First Nations in the Deh Cho region to address local concerns about contaminant levels and health of a primary country food source.

Latour, Paul
Canadian Wildlife Service
5204-50 Ave, Suite 301
Yellowknife, NT X1A 1E2

Permit No.: 4961 **Species Studied:** General wildlife
Region: DC **Location:** Sambaa K'e Protected Area

Research in the Proposed Sambaa K'e Prtoected Area
Research may be composed of verifying and describing the main habitat components of the area; including: an inventory of flora and fauna, listing kep species and generating baseline data in order to assess their importance for conservation.

Maaskant, Shirley
MGM Energy Corp.
4700 Bankers Hall West,
888-3rd St. SW
Calgary, AB T2P 5C5

Permit No.: 5362 **Species Studied:** Muskrat, Wolverine, Grizzly bear and Moose, Tundra Swan, Brant, Goose, Snipe, Sanpiper
Region: IN **Location:** Near Tuktoyaktuk and Aklavik

MGM Energy Corp. 2007, 2008 and 2009 Summer Field Assessment and Advance Barge Project
The wildlife study component of the Project will focus on identifying and documenting habitat for avian and terrestrial wildlife in the vicinity of winter drilling activities.

Mulders, Robert
ENR North Slave
600, 5102-50th Ave.
Yellowknife, NT X1A 3S8

Permit No.: 5651 **Species Studied:** Wolverine
Region: NS **Location:** Central Barrens

Wolverine DNA Sampling on the central barrens

Murphy, Brent
BHP Diamonds Inc.
1102 4920-52 St.
Yellowknife, NT X1A 3T1

Permit No.: 5571 **Species Studied:** Caribou, grizzlies, wolves, wolverine, birds and raptors
Region: NS **Location:** EKATI Diamond Mine Area

Wildlife Effects Monitoring Program (WEMP)
Test impoact predictions and efficacy of mitigation measures for Caribou, grizzlies, wolves, wolverine, upland breeding birds and raptors.

Richardson, Evan & Stirling, Ian
Canadian Wildlife Service
5320 122 Street
Edmonton, AB T6H 3S5

Permit No.: 3318 **Species Studied:** Polar Bear
Region: IN **Location:** Outer Mackenzie Delta & nearshore Southern Beaufort Sea

Assessment of possible impacts of oil and gas activities on polar bears in the outer Mackenzie Delta and nearshore Southern Beaufort Sea.

Slattery, Stuart
Ducks Unlimited Canada
PO Box 1160
Stonewall, MB R0C 2Z0

Permit No.: 3324 **Species Studied:** Scoters and Scaup
Region: GW **Location:** Tundra-Cardinal-Clearwater Lakes (about 90km south of Inuvik)

Demographic breeding duck study in the Cardinal Lake area

Young, Lasha
Golder Associates
1000, 940-6th Avenue SW
Calgary, AB T2P 3T1

Permit No.: 4752 **Species Studied:** General wildlife
Region: DC **Location:** Cameron Hills gathering system and trans-border pipeline

Winter Track Counts in Paramount's Cameron Hills

Archaeology Permits

Andrews, Tom
Prince of Wales Northern Heritage Centre, GNWT

Permit No: 2007-017 **Class:** 2
Region: SA **Location:** Mackenzie Mountains in the Tulita District (62.966660 N,-129.34511 W)

NWT Ice Patch Project (2007)
Funded by the International Polar Year (IPY) program, the Northwest Territories Ice Patch Study combines the physical, biological and social sciences with traditional knowledge to investigate past and present environmental and human change in the Mackenzie Mountains. As repositories of well preserved archaeological artifacts and ancient biological specimens, permanent ice patches provide a long term material record of human hunting practices and data on the diet composition, health and genetic histories of past caribou populations. Collection and analysis of these specimens will contribute to the understanding of the human history of the North and the ecology of caribou populations over time. A geophysical study to determine the internal structures and formation processes of ice patches and traditional knowledge research to investigate oral traditions about hunting caribou on ice patches and human adaptation to the alpine environment will compliment these studies.

Through this multidisciplinary research design, the researchers are gaining an understanding of how caribou populations and people have adapted to climate change over the past several thousand years in the Mackenzie Mountains. This knowledge will assist resource managers in the development of effective management strategies for caribou populations currently faced by changing climate regimes. They hope that effective management of caribou populations will contribute to the sustained health and cultural well-being of Aboriginal communities that rely on caribou for traditional subsistence activities.

Designed in partnership with the Tulita Dene Band, this project has a strong education program consisting of a science camp for Aboriginal students to be held in the Mackenzie Mountains during the main IPY years of 2007 and 2008.

Significant discoveries were made during the 2007 field season including 5 new ice patch archaeological sites where wooden and stone artifacts were recovered. Radiocarbon dates of the artifacts revealed that bow and arrow technology was in use about 300 years ago, while dart throwing technology was used about 2400 years ago. An additional 10 target—locations where researchers found melting ice and significant amounts of caribou fecal matter, but no visible artifacts as yet—will be monitored over the next two years as they may eventually produce cultural remains. Geophysical studies at two sites produced exciting results too. Ground penetrating radar studies and a core extracted from one of the patches revealed layers of caribou dung separated by ice indicating growth over time. Samples of the dung have been radiocarbon dated to help researchers understand how the ice patches formed and how long they have before melting entirely. Bones of animals that were killed or died naturally near the ice patches were collected during the field season and they have been identified as to genus and species. Radiocarbon dates and stable isotope analysis of the caribou bones will help researchers understand changes in caribou ecology over the last 4000 years. As well, a 5-day science camp in August, involving Shutagotine (Mountain Dene) students and elders from the community of Tulita, was a great success where both elders and scientists shared in teaching students and learning from each other.

Apland, Brian
EBA Environmental Services Ltd. And behalf of North American Tungsten Corporation Ltd.

Permit No: 2007-005 **Class:** 2
Region: SA **Location:** Macmillan Pass area, 300km northwest of Yellowknife in the Mackenzie Mountains. NTS map sheet 105O08

MacTung Project
This study conducted an archaeological inventory and site assessment of the project area in accordance with earlier studies.

Arnold, Charles D.
Prince of Wales Northern Heritage Centre, GNWT

Permit No: 2007-002 **Class:** 2
Region: IN **Location:** Mackenzie Delta

Mackenzie Delta Heritage Research Project: Excavations at the Pond Site (NiTs-2)
In summer, 2007 the Prince of Wales Northern Heritage Centre returned to the Pond site (NiTs-2) on the west shore of Richards Island near the mouth of the East Channel of the Mackenzie River. The site has several clusters of house remains visible as shallow depressions in the ground surface. This area is remembered in Inuvialuit oral histories as one of the winter villages of the Kuukpangmiut.

The Pond site was first investigated by the PWNHC in the late 1980s. Excavations at that time uncovered well-preserved remains of two driftwood and sod houses. The 2007 excavations included, as one of its objectives, documenting the remains of a third structure by using a mobile laser scanner. The work was undertaken in partnership with researchers from the University of Calgary.

House 3, excavated in 2007, proved to be quite unusual in that it lacked substantial driftwood architecture, and in comparison with other houses at the site the numbers of artifacts and amount of faunal remains were quite low. Three radiocarbon dates indicate this house was built approximately 1500 AD, which is about 200 years later than the two previously excavated dwellings. Ongoing analysis will test the hypothesis that this was a temporary structure occupied before the onset of winter, when more substantial driftwood and sod houses were used. The laser scans of the excavated features will facilitate the ongoing study of the structure as part of an ongoing study into the variability of traditional architecture in the Inuvialuit region.

Benson, Kristi
Gwich'in Social and Cultural Institute

Permit No: 2007-006 **Class:** 2
Region: GW **Location:** Arctic Red River headwaters about 300km south of Tsiigehtchic in the Mackenzie Mountains

Arctic Red River Headwaters: Heritage Resources and Traditional Use
With support from the Social Sciences and Humanities Research Council of the Government of Canada's Northern Development Fund, the Gwich'in Renewable Resource Board, and the Historic Places Initiative of the Government of the Northwest Territories, the Gwich'in Social & Cultural Institute conducted a traditional ecological knowledge and initial archaeological survey project about and within the headwaters of the Arctic Red River. The interviews and survey were the third phase of the study, which has also included an extensive literature review (Phase I) and traditional knowledge and traditional use interviews (Phase II). Archaeological survey was based on information provided by interviewees (previously conducted interviews as well as TEK interviews with Tsiigehtchic residents conducted for this project), hunting guides, and other sources including archaeological site data from nearby areas and historic documents.

The field crew stayed at the Arctic Red River Outfitters base camp at the mouth of the Arctic Red River, and conducted walking surveys of various locations identified by Elders or through archaeological potential assessment. Remote locations away from the base camp were accessed using SuperCub aircraft. An overflight of the study area was conducted in a Cessna 206. Crew consisted of GSCI contractor Kristi Benson, University of Calgary archaeologist Dr. Brian Kooyman, and archaeological assistant/guide Sonny Blake, of Tsiigehtchic. Shovel tests were excavated where appropriate, although the survey focussed on reconnaissance-level objectives. Numerous axe-cut stump sites were located during survey as well as one possible hearth feature which is being radio-carbon dated. One axe-cut stump, which grew two new leaders subsequent to the original harvest, was sampled for examination by a dendrochronologist. The project focussed on assessing the potential of the area for further heritage work.

Bussey, Jean
Tibbitt to Contwoyto Winter Road Joint Venture

Permit No: 2007-010 **Class:** 2
Region: NS **Location:** A linear corridor running between Tibbitt Lake and Pellatt Lake (85I11, 14, 85P03, 06-09, 75M11-16, 76D01, 08, 09, 16, 76C13. The project also includes two proposed alternate southern routes, 85P02, 04, 10, 85O01, 85J16, 09). The road continues into Nunavut.

Tibbitt to Contwoyto Winter Road Project
In 2007, Points West Heritage Consulting Ltd. conducted archaeological investigations for the Joint Venture that operates the Tibbitt to Contwoyto Winter Road. These investigations were directed by Jean Bussey with the assistance of Brian Apland, of Points West, and Darcy Ross, of the North Slave Metis Alliance. Two field trips were required, one for monitoring in late June and the second in mid-July.

Archaeological monitoring of recorded sites along the existing winter road indicates that annual examination of the sites should continue. It was discovered that more substantial markers are required at one site near Lac de Gras camp. The Joint Venture has committed to having these installed. Examination of a potential gravel source near the existing route north of Lockhart Lake resulted in the discovery of a new archaeological site. The aerial reconnaissance of the existing secondary route and the proposed northern alternate route suggests that no further archaeological investigation is required provided no route changes are identified. Although there is archaeological potential on adjacent landforms, the actual track is suggestive of low sensitivity.

A combination of aerial and ground reconnaissance was employed along the proposed route of the SOR; potential borrow sources were also examined. Subsurface testing was undertaken at locations with moderate or greater archaeological potential when surface visibility was not sufficient. As a result of these investigations, one location with modern mining activity and six prehistoric sites were discovered. Most of the archaeological sites are avoidable with minimal route modification or by elimination of potential borrow sources from further consideration; one small, sparse site appears to be on the route and will require assessment to determine suitable mitigation if avoidance is not feasible. Once the final route has been determined, it will be necessary to conduct additional field reconnaissance.

Bussey, Jean
De Beers Canada inc.

Permit No: 2007-009 **Class:** 2
Region: NS **Location:** Kennady Lake Area (75N01-16, 75M08-10,15,16)

Gahcho Kue Project
The objectives of the 2007 field investigations consisted of site assessment and site discovery and protection. Two previously recorded sites were assessed. KiNp-76 is located within 500 m of the proposed waste rock storage area and testing suggests that future investigation is required and should consist of limited subsurface excavation and systematic surface collection. Investigations at KlNs-2, located near MacKay Lake, indicate that no further investigation is required.

Archaeological investigations were also conducted on eighteen sections of esker that were identified as potential sources for construction material for the proposed Gahcho Kué Project. The sections differ in length and are located at varying distances from the proposed mine site and its current winter access route, which connects with the Tibbitt to Contwoyto winter road on MacKay Lake. The archaeology crew worked with a geotechnical representative from AMEC Earth and Environmental (AMEC) to ensure that proposed sampling activities did not impact recorded or unknown archaeological sites.

The procedure for the geotechnical portion of the archaeological work was to first view each section of esker from the air to assist in the selection of areas suitable for sampling. Once on the ground, the AMEC technician indicated the location of a proposed sample and the Points West crew intensively examined the area to a distance of at least 30m. If an archaeological site was discovered, the sample location was moved to an adjacent area that contained no artifacts. Previously recorded sites were avoided during the geotechnical sampling program; 38 recorded sites are located on or adjacent to eskers included in the sampling program.

Eight new archaeological sites were discovered as a result of the geotechnical program. The sites range from an isolated find (single projectile point) to very large sites with numerous concentrations of unworked lithics and scattered stone tools. The archaeological work conducted was not an intensive inventory and it is likely that additional sites will be found on or near most of these esker sections. A detailed archaeological inventory of the selected location or locations is required should any of the 18 sampled landforms be identified as a suitable esker source.

Bussey, Jean
Rescan Environmental Services Ltd., on behalf of BHP Billiton Diamonds Inc.

Permit No: 2007-007 **Class:** 2
Region: NS **Location:** Coppermine River Basin, in the Lac de Gras area.

EKATI Diamond Mine Project
Jean Bussey of has conducted archaeological investigations in the BHP Billiton its claim block north of Lac de Gras since 1994. Selected archaeological sites located near development areas have been tested and/or mitigated through subsurface excavation and/or surface collection, while sites well removed from activity areas have been recorded and are periodically revisited, but are otherwise avoided.

The majority of the recorded sites near the Ekati Diamond Mine are associated with eskers, but sites are also found on other terrain types, usually near the larger lakes. There are still many portions of the claim block that have not been inventoried because no development or exploration activity has been identified in the vicinity. The majority of the sites are best described as lithic scatters; sites that are characterized by unworked flakes of stone and may include an occasional tool. The most common lithic or stone material is quartz, which is found naturally as veins in the bedrock of the Lac de Gras area. Quartz cobbles are also found naturally in the numerous eskers in the claim block and it is suggested that both sources of quartz were utilized prehistorically for stone tool manufacture.

A number of the sites in the BHP Billiton claim block have yielded small chert tools suggestive of the Arctic Small Tool tradition, which may date 2500 to 3500 years before present, but the majority of the archaeological sites probably relate to activities conducted in the last 2500 years. Although most sites are associated with the prehistoric period, a number of traditional use sites have also been identified with the assistance of interested First Nations.

Brian Apland, of Points West, and Darcy Ross, of the North Slave Metis Alliance, assisted with the archaeological field work conducted in early July. These investigations were limited to the examination of 14 proposed advanced exploration locations. Archaeological investigations involved a combination of aerial examination and ground reconnaissance. Areas with moderate or greater archaeological potential were traversed on foot and exposures and bedrock outcrops within the development areas were closely examined. One new archaeological site was discovered and there are now 200 archaeological sites recorded in the claim block.

Three archaeological tours for community representatives were conducted in September 2007. Two tours were held concurrently and because of weather conditions, it was not possible to visit archaeological sites.

Clarke, Grant
Tli Cho Landtran Transportation Ltd.

Permit No: 2007-019 **Class:** 2
Region: NS **Location:** Snap Lake to Munn Lake (75M9, 75M10)

Snap Lake to Munn Lake Winter Road Assessment
This study identified any heritage and/or cultural resource concerns that may be present in the project area, evaluated the significance of those concerns and recommend appropriate mitigation.

Clarke, Grant
BG Canada Exploration and Production Inc.

Permit No: 2007-003 **Class:** 2
Region: SA **Location:** Project centres on the Hare Indian (Rabbitskin) River, in the Colville Hills

Heritage Resources Impact Assessment of the 2007 Colville Hills 2D Seismic Program
This study identified any historical or cultural resourse concerns that may be present in relation to the proposed seismic program.

MacKay, Glen R.
Prince of Wales Northern Heritage Centre, GNWT

Permit No: 2007-012 **Class:** 2
Region: DC **Location:** Trout Lake

Sambaa K'e Archaeology Project
This study conducted an archaeological impact assessment of a proposed forestry base and continued the community-based archaeological research project initiated in 2005.

MacKay, Glen R.
Prince of Wales Northern Heritage Centre, GNWT

Permit No: 2007-011 **Class:** 2
Region: DC **Location:** Sambaa Deh Falls Territorial Park

Sambaa Deh Archaeology Project
This study investigated site JgQx-1, recorded in 2006, by mapping the full extent of the site and investigating its subsurface contents.

Webster, Sean
Public Works and Government Services Canada

Permit No: 2007-015 **Class:** 2
Region: DC **Location:** Axe Point on the Mackenzie River near Fort Providence (61:17:40, 118;40;50)

Heritage Resources Impact Assessment at Axe Point Former Military Site
The purpose of the study was to identify, record, and evaluate structures and features associated with the former U.S. military base (JjQq-3) prior to remediation; to conduct subsurface testing within the area of the of the former military base; to assess the potential for previously unrecorded heritage resources; and to investigate the boundaries of JhQq-1, a former Dene Village located to the west of the former military base, so a buffer could be established around the site for avoidance during the proposed remediation activities.

Procedures employed in the assessment at Axe Point included pre-field studies, on-ground reconnaissance, site documentation and assessment, reporting and recommendation formulation. Project planning also included provisions for a community representative from Fort Providence to work with the archaeologists during the field inspection and to provide additional insight regarding the layout, nature and history of the site area.

As the remediation project represents the removal of all materials associated with the former Axe Point military base, one focus of the field program was data collection related to the buildings and features within the base area. Data collection included digital photography, building and feature descriptions (both qualitative and quantitative), and detailed site mapping, completed by Maskwa Engineering of Hay River. A number of structures and features were recorded including a barge, a boiler, six Quonset huts, three CANOL trailers, a mess hall, a warehouse, an amphibious tracked vehicle, and a number of buildings and cribbed/berm areas of unknown function.

Investigations were also conducted to determine the boundaries of the former Dene village (JhQq 1). Two cabins were identified and described to the west of the military base and a buffer was established so that impact to the site was avoided. In addition, shovel testing in the area of the military base revealed evidence of extensive disturbance, likely associated with base construction, and no impacts to previously unrecorded heritage resources are anticipated as a result of the remediation activities at Axe Point.

Wickham, Michelle
PetroCanada

Permit No: 2007-018 **Class:** 2
Region: SA **Location:** Deline District at 96B, G (64 38 45.8880 N, 122 40 57.4680 W)

Kwijika M-59
This study identifed any unrecorded sites that might have been impacted by the current development activities.

Wickham, Michelle
Husky Oil Operators Ltd.

Permit No: 2007-016 **Class:** 2
Region: SA **Location:** Tulita district: 96C and 95N, (64 2.7348 N 124 17.8938 W to 63 54.8804 N 125 2.7728 W)

Husky et al Cloverleaf B-20
This study identfied and developed mitigation plans for any unrecorded sites that might be impacted by further development of the project area.

Youell, Alan
MGM Energy Corporation

Permit No: 2007-013 **Class:** 2
Region: IN **Location:** 107B & C, Langley Island, Mackenzie Delta

MGM Energy 2007Summer Field Assessment
This study comprised of archaeological investigations for five proposed drilling locations (well pad and flare stack pad) and one barge landing site associated with the MGM Energy 2007 Summer Field Assessment Program. The investigation is part of a larger program of biophysical study that is designed to assess potential future development locations. The specific purpose of the archaeological study in this MGM Energy 2007 Summer Field Assessment Program was to identify archaeological, historical and traditional land use sites at the proposed drilling and barge landing sites.

To conduct the assessment, archaeologist Alan Youell was assisted by wildlife monitor Rufus Tingmiak of Inuvik. Field reconnaissance consisted of pedestrian traverse, surface examination and shovel testing to determine the presence of unrecorded archaeological or cultural sites. Shovel tests were excavated at 6 proposed development locations.

The areas investigated during the archaeological assessment of the MGM Energy 2007 Summer Field Assessment Program included the exploratory sweet natural gas drilling locations identified as Atik, Aput, Ellice Deep, Ellice Shallow and Langley South, as well as a barge landing location. All potential developments are located on the outer western Mackenzie Delta, on Langley and Ellice Islands adjacent to either the Reindeer or Arvoknar channels of the Mackenzie River. The Atik location, which is the southernmost of the five, lies slightly north of the Reindeer Channel on an unnamed island immediately southwest of Langley Island. The Atik barge landing is located on the northwest bank of the Reindeer Channel. The Aput drill location lies on the south end of Ellice Island, north of the Reindeer Channel. The Ellice Shallow and Ellice Deep drilling locations are both on Ellice Island. Both drilling locations are adjacent to a large unnamed lake. The Langley South drilling location, which is the easternmost of the five, lies southeast of the main Arvoknar Channel on Langley Island.

All of the drilling locations and the barge landing were found to be located on areas of relatively active alluvial plain that is subject to seasonal flooding. Continuous remodelling of this area, combined with shallow sediments and underlying waterlogged clays and silty clays, rendered the locations as possessing a low potential for the identification of archaeological or cultural sites. Surface inspection and shovel testing of the development footprints did not identify any archaeological or cultural sites.

Fish Research Permits

Alikamik, Buddy
PO Box 142
Ulukhaktok, NT X0E 0S0

Permit No: X-07/08-4001-IN

The goal of this research was to collect data to determine whether or not commercial Arctic char fishery is sustainable for Ulukhaktok.

Barber, David
University of Manitoba
125 Dysart Road
Winnipeg, MB R3T 2N2

Permit No: S-07/08-4017-IN

The Circumpolar Flaw Lead (CFL)
Please see ARI licence 14258 for the project description.

Charles Bryant Helen Kalvak Elihakvik School
PO Box 162
Ulukhaktok, NT X0E 0S0

Permit No: E-07/08-4001-IN

The On the Land Activities Program
This project caught 19 char and 4 salmon at end of September. This program allowed students to earn school credits for their participation.

Cobb, Donald
Fisheries and Oceans Canada
501 University Crescent
Winnipeg, MB R3T 2N6

Permit No: S-07/08-4004-IN

Multibeam Mapping Program
The goal of this research was to provide data regarding the presence of fish in support of an on-going multibeam mapping program of the Beaufort Sea floor, and to contribute to the general biological and ecological information on offshore pelagic and benthic fish populations.

Cobb, Donald
Fisheries and Oceans Canada
501 University Crescent
Winnipeg, MB R3T 2N6

Permit No: S-07/08-4009-IN

The purpose of the this benthic sampling research were twofold: 1) to gather data quantitative data on benthic community structure relative to proposed gas and oil activities, and 2) to sample a wide range of bottom features focusing on invertebrate community structure and the response of the benthos to processes such as upwelling ocean currents, sea ice scour, sand mining activity, and methane gas flux. Benthic samples were taken using a box corer at specific, priority situations.

Evans, Marlene
Environment Canada
11 Innovation Blvd.
Saskatoon, SK S7N 3H5

Permit No: S-07/08-4000-IN

A biological study of waters, within the Inuvialuit Settlement Region, along the proposed Mackenzie Gas Pipeline route
In July 2007 researchers retreived samples of plankton and benthic inverterbrates from Noell Lake, East Hans Lake, Parsons Lake, Yaya Lake, Mid Lake, Old Trout Lake, Kimialuk Lake, Big Lake, Denis Lagoon.

Evans, Marlene
Environment Canada
11 Innovation Blvd.
Saskatoon, SK S7N 3H5

Permit No: S-07/08-4001-IN

A biological study of waters, within the Gwich'in Settlement Area, along the proposed Mackenzie Gas Pipeline route

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Evans, Marlene
Environment Canada
11 Innovation Blvd.
Saskatoon, SK S7N 3H5

Permit No: S-07/08-4020-IN

Temporal trends and spatial variations in persistent organic pollutants and metals in sea-run char from the Canadian Arctic

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Fortier, Martin
GIROQ, Univeristé Laval
Pavillion Alexandre-Vachon Local 2078 Université Laval
Quebec, PQ G1K 7P4

Permit No: S-07/08-4013-IN

The ice pack that covers the central Arctic Ocean has thinned substantially in the last 30 years and its areal extent has shrunk by 14%. The ice cover controls air-sea exchange of gases (including greenhouse gases), determines the rate of sequestration of carbon dioxide by the Arctic Ocean, and is the only habitat of the unique Arctic fauna. Variability in ice cover is particularly important on the immense and shallow continental shelves that border the Arctic basin. Given the possibility of a sustained reduction of the ice cover of Arctic shelves in response to climate warming, the Canadian Arctic Shelves Exchange Study (CASES), a major international effort under Canadian leadership, aimed at understanding the biogeochemical and ecological consequences of sea ice variability on the Mackenzie Shelf. The marine science component of ArcticNet continued the long term data collection, which started with the CASES program, with the main objective of better understanding the impacts of climate variability and change on the Canadian Arctic marine environment.

Harwood, Lois
Fisheries and Oceans Canada
Suite 101 5402-50th Avenue
Yellowknife, NT X1A 1E2

Permit No: S-07/08-4006-IN

Ringed Seal and Bearded Seal Stock Health
The goals of this research were to examine the aspects of regional ice conditions and to coordinate with, and provide samples for, "stock health" related studies, such as disease and contaminants. Community-based programs were used to sample and measure ringed seals taken in the annual harvest. 101 Ringed seals were sampled from Uluhaktok and 25 Ringed seals were sampled from Sachs Harbour. 2 Bearded Seals were sampled from Uluhaktok. All seals were sampled from subsistence harvesters.

Harwood, Lois
Fisheries and Oceans Canada
Suite 101 5402-50th Avenue
Yellowknife, NT X1A 1E2

Permit No: S-07/08-4007-IN

Affects of changing acoustics caused by offshore drilling on Bowhead whales
Bowhead whales of the Western Arctic population come to the Beaufort Sea each summer to feed, and form large loose aggregations in the offshore Beaufort from approximately mid August to late September. The aggregations form in traditional areas where oceanographic conditions favour the concentration of zooplankton, their main prey item. Not all aggregation areas are attractive to bowheads in all years, due to varying oceanographic conditions. Some of these feeding aggregation areas are located in offshore waters which have been subject to seismic exploration activity in the 1980's, in 2006, and for which extensive seismic
projects are planned for 2007. In addition, on their return fall migration to the Bering Sea, this same stock is also subject to extensive shipping and seismic activities in the Alaskan Beaufort and Chukchi seas. Bowheads feed in these aggregations in the Canadian Beaufort Sea for 6-8 weeks, and actively gain condition as well as replace stores expended during migration. Disturbance of whales from underwater noise emanating from ships, barges, aircraft, seismic operations, scientific operations or other sources of noise associated with the MGP or induced industrial underwater noise, as well as all the same sources and activities in Alaska, can elicit avoidance responses in the whales. Real-time aerial surveys were conducted in August to provide regional information on bowhead distribution at the time of the seismic survey and tagging, and in turn will be available for mitigation plan and actions. Similar surveys are planned for 2008 and 2009. Five whales were also tagged with satellite tracking devices to provide a clearer view on their movements.

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Permit No: S-07/08-4027-IN

Assessment of Arctic char stock of Fish Lake, through harvest-based monitoring of subsistence catches
Harvest-based program involved enumerating and measuring Arctic charr taken in the annual harvest at Fish Lake in October. Indicators of stock status such as CPUE, age, length, weight, sex and maturity are used to evaluate the impact of the fishery on the stock and to provide information on status and life history of the charr stock. This project has been done annually since 1992, and is one of the longest charr monitoring studies in place in the ISR. It has provided important support for formulation, delivery and compliance of the Holman Charr Fishing Plan.

200 Arctic char were caught using subsistence fishing at Fish Lake from October 16-25, 2007.

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Fisheries and Oceans Canada
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Permit No: S-07/08-4028-IN

Ringed Seal observation from the CCGS Amundsen

The goals of this research are 1) to examine the distribution, movements and behaviour of ringed seals that happen to enter the moon pool of the CCGS Amundsen as part of the IPY project, as an indication of the use of the

Circumpolar Flaw Lead, and the land fast ice habitats during spring; 2) to examine philopatry in subadult and adult seals tagged during the spring breeding season: Flipper tags that will be applied to the same animals, if they remain in place beyond the spring moult, will provide an indication of the distribution of animals following the moult, their fall migration patterns and destinations, and possibly if they return to the Canadian Beaufort (philopatry); 3) to examine the possible overlap of seals and the ship in space and time, to observe seal behaviour in relation to the ship itself and ancillary activities associated with the ship.

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Permit No: S-07/08-4021-IN

Assessment of Arctic char stock of the Hornaday River through harvest-based monitoring of subsistence catches
58 Arctic char were caught and sacrificed through subsistence fishing at Hornaday River from August 29 to September 16, 2007.

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Permit No: S-07/08-4025-IN

Estimate of the number of spawning char at the Fish Hole of the Rat River
The goal of this research was to assess the spawning char at the Fish Hole in the Rat River. Mark-Recapture floy tags techniques were employed. The information collected included: size, sex and maturity of char at the Fish Hole, particularly as a means of monitoring the health and status of the spawners. 432 Dolly Varden were caught and 426 were tagged and released.

Hiebert, Erin
Fisheries and Oceans Canada
PO Box 1871
Inuvik, NT X0E 0T0

Permit No: S-07/08-4019-IN

Dolly Varden Char Monitoring
The goal of this research was to obtain samples of Dolly Varden char from the 2007 fishery in Aklavik and Fort McPherson. The dead fish were measured, weighed and tissue samples are collected by DFO through community monitors in order to assess local Dolly Varden char stocks. This project was requested by the communities, supported by each RRC, and funded by the Gwich'in Renewable Resource Board. 40 Dolly Varden char were caught at each Big Eddy, Mouth of Rat River and Destruction City from August 08 to September 09, 2007.

Johnson, Jim
Fisheries and Oceans Canada
501 University Crescent
Winnipeg, MB R3T 2N6

Permit No: S-07/08-4014-IN

Nearshore Ecosystem on the North Slope
The goals of this research were 1) to establish benchmark data for fish populations in nearshore North Slope waters – for future monitoring efforts by environmental impact assessors, regulatory agencies, and environmental stewards; 2) to examine changes to fish communities over the past 20 years to put into proper context future studies examining the impacts of climate change, gas & oil development and exploitation; 3) to develop a better overall understanding of the nearshore ecosystem to allow ecosystem based management of its resources; 4) to determine the condition of populations of specific species of special interest to communities and fisheries managers e.g., the condition of cisco populations; 5) to support, by providing samples, other research, having linkages to our project, in the area including:

the offshore marine fish program - CCGS Nahidik; Sensitive Species fish project funded by Gas Pipeline money; PERD funded stable isotope study; genetics research on North Slope char; ongoing contaminants research; and research examining the lowest trophic levels of the food web through stable isotope analysis. Approximately 45 350 were caught at the field camp in Phillips Bay. 21% of the catch was Arctic cisco and another 15.1% was least cisco. Other fish included: rainbow smelt, broad whitefish, lake whitefish, Dolly Varden char, Arctic flounder, fourhorn, sculpin, saffron cod, starry flounder, Pacific herring, blackline prickleback, Arctic Lamprey, inconnu and Arctic cod.

Lesack, Lance
Simon Fraser University
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Burnaby, BC V5A 1C6

Permit No: S-07/08-4003-IN

Nutrient Cycling in the Mackenzie Delta
This is a portion of a long-term project to develop a biogeochemical model for lakes in the Mackenzie Delta that will access the effects of multiple stresses on rivers resulting from global change. This year's work focused on evaluating the resolution of the sources and fates of dissolved organic carbon (DOC) in aquatic food webs of the Mackenzie Delta, the annual effect of the Mackenzie Delta on nutrient flow to the Arctic Ocean and assessing the role of DOC in structuring the distribution of transparent exopolymer particles in Mackenzie Delta lakes.

Millar, Nathan
Gwich'in Renewable Resource Board
P.O. Box 2240
Inuvik, NT X0E 0T0

Permit No: S-07/08-4005-IN-A1

Travaillant Lake System Project
The goal of this project was to determine the biological characteristics and relative abundances of fishes in the Travaillant Lake system with a focus on key harvested fish species (lake whitefish and broad whitefish). Results from the fish samples in the Travaillant Lake system are the following: 376 Broad whitefish, 338 lake whitefish, 95 lake cisco, 1 lake trout and 16 northern pike from July 13 to 23 and October 19 to 26.

Nielsen, Jennifer
U.S. Geological Survey (USGS) - Alaska Science Center
1011 East Tudor Road
Anchorage, AK 99503

Permit No: S-07/08-4011-IN

Arctic cisco in the Mackenzie River System
The goals of this research are to determine: 1) how results from genetic markers compare to other published studies in their ability to differentiate putative spawning populations in the Mackenzie River system; 2) how effective a combined microsatellite and mtDNA genotype is in assigning Colville River fish to a population of origin 3) if multi-elemental composition of Arctic cisco otoliths can be used to build a baseline to identify tributary of origin of Arctic cisco captured in Alaskan waters. In total 117 Arctic cisco were caught, other fish included: broad whitefish, sheefish, walleye.

Papst, Michael
Fisheries and Oceans Canada
Freshwater Institute
501 University Crescent
Winnipeg, MB R3T 2N6

Permit No: S-07/08-4008-IN

Icthyoplankton dispersion in the Canadian Beaufort Sea
The objective for the project was to examine icthyoplankton dispersion in the Canadian Beaufort Sea. The Mackenzie River plume front off of Kugmallit Bay and the Herschel Basin area were the two main areas of interest and may have an effect on icthyoplankton dispersion.

Reimer, Ken
Royal Military College
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Kingston, ON K7K 7B4

Permit No: S-07/08-4016-IN

To assess the risk of contaminants at a former DEWline site to humans and the environment
The activities of this research included: 1) completing a second round surface delineation program looking at the type of contamination as well as the lateral and vertical extent of contamination in new and known soil contaminated areas; 2) taking sub-surface depth sampling program for hydrocarbons in new and known soil contaminated areas; 3) collecting soil, water, and animal (sculpins and siksik) samples, for screening level risk assessments & development of site specific remediation criteria. This was done at BAR-B, Stokes Point at the former DEW Line station.

Shopik, Tim D.
Imperial Oil Resource Ventures Limited Calgary
237 Fourth Ave. SW
PO Box 2480 Station M
Calgary, AB T2P 3M9

Permit No: S-07/08-4015-IN-A1

The main objectives of the fish and fish habitat studies included: 1) the characterization of the fish community in, and immediately adjacent to watercourses and water bodies potentially affected by the project; 2) assessment of fish habitat and major habitat features present.

Shopik, Tim D.
Imperial Oil Resource Ventures Limited Calgary
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Calgary, AB T2P 3M9

Permit No: S-07/08-4018-IN
The main objectives of the fish and fish habitat studies included: 1) the characterization of the fish community in, and immediately adjacent to watercourses and water bodies potentially affected by the project; 2) assessment of fish habitat and major habitat features present

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Stern, Gary
Fisheries and Oceans Canada
Freshwater Institute
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Winnipeg, MB R3T 2N6

Permit No: S-07/08-4010-IN

Mercury temporal trend studies in the Beaufort Sea
In conjunction with other ongoing projects (CFL (IPY) 2007-2011, ArcticNet (2005-2011) and NCP) designed to study climate variation and its link to increasing mercury levels, it is imperative that the mercury temporal trend studies in the Beaufort Sea marine mammals continue. In this study, the researchers extend their current data set to include data on Hendrickson Island beluga, Holman Island and Sachs Harbour ringed seal.

ArcticNet, IPY (CFL) and NCP (analysis of organic contaminants) strongly leverage the funding proposed in this project by providing both funding and infrastructure (e.g. River based work, CCGS Amundsen, students and researchers). This project allowed a gain in understanding of the feeding and mating behaviours of beluga whales. Specific mating systems were determined through the examination of male and female reproductive tracts. Female reproductive anatomy was used to provide information on a species mating system because it is the selective force in the evolution of large sperm size and numbers in species exhibiting sperm competition.

Tallman, Ross
Fisheries and Oceans Canada
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Permit No: S-07/08-4012-IN

Identification and description of spawning and over-wintering habitats of anadromous fish species in the Mackenzie Valley
The goals of this research included: 1) identify critical spawning and over-wintering areas for migratory broad whitefish, lake whitefish, inconnu, and Arctic cisco populations in the Mackenzie Valley; 2) determine the timing of migration into spawning sites and actual time of spawning for migratory broad whitefish, lake whitefish, inconnu, and Arctic cisco populations in the Mackenzie Valley; 3) describe specific environmental characteristics of over-wintering and spawning habitats of anadromous fish in the Mackenzie Valley.

Tallman, Ross
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501 University Crescent
Winnipeg, MB R3T 2N6

Permit No: S-07/08-4026-IN

Fish habitat selection relative to water velocity
The objective of this research was to determine 1) where fish are located in the water column, 2) the velocity of the water in different areas of the water column, 3) if different sizes or species of fish select different areas within the water column, and 4) if variation in size or species distribution is found within the water column is water velocity a physical barrier to certain fish. Collectively, this information helps to explain fish habitat selection relative to water velocity.

Thompson, Amy
Gwich'in Renewable Resource Board
PO Box 2240
Inuvik, NT X0E 0T0

Permit No: S-07/08-4002-IN

An investigation into the occurrence of burbot liver atrophy in the Gwich'in Settlement Area
This study took place in Inuvik, Tsiigehtchic, Fort McPherson and Aklavik.

Glossary

Abiotic – Not living

Active layer -The area where the soil continually freezes and thaws above the permafrost

Adaptation - A process by which a living organism (human, animal or plant) changes to become better suited to a new environment. This generally on an evolutionary timescale however, in the human context, it may be over a short period.

Aerial - In the air

Aeromagnetic survey - Surveys from aircraft that make use of the magnetic field caused by magnetized rocks in the Earth's crust to make estimates about underlying geology of a given area such as distribution of potential resources

Algae - Simple living aquatic single or multi celled plant organisms that contains chlorophyll

Algorithm - A procedure or formula for solving a problem

Alkali - A basic substance that can range in strength

Analytical - A detailed examination of the structure or some other parameter of a substance or thing

Anoxic - A situation where oxygen is present in very low amounts or not at all, common in water

Annual - Occurs every year

Anthropogenic - Caused by a human action

Anthropology - The study of the human beings including their origins, cultures, evolution

Aquatic - Of water

Aquatic Biota - All living organisms in the aquatic environment

Archaeology - The study of past human life and culture by looking at remains and artifacts like tools

Archean - A period of geologic time from about 3.9 billion years to 2.5 billion years ago

Archival - Pertaining to a collection of documents, normal over long periods of time

Arsenic - A chemical element that is gray in color and that is highly poisonous with no taste

Artifact - A historical tool, weapon or other human-made object that can be studied

Asexual - An organism that reproduces without the aid of a partner and who passes on all of its genetic information

Atmosphere - The layers of gases that surround and protect the Earth

Attributed - To explain by indicating a cause

Bacteria - A large and varied group of single-celled microorganisms

Baseline - A set of information and data serving as a basis for comparison into the future

Bathymetry - Underwater topography. Mapping the underwater contours of the bottoms of water bodies

Beaufort Gyre - The major ice and ocean current circulation of the Arctic Ocean

Benthic - Organisms that live at the bottom of a body of water

Benthos - The bottom of the ocean or body of water

Biochemistry - The study of chemical processes in living organisms

Biodiversity - Pertaining to the variety of species in an area

Biogenic - Produced by living organisms or biological processes

Biogeography – The study of the geographical distribution of organisms

Biomass - The total amount of all living material within a specific volume of the environment

Biomes - Distinct areas of the Earth that are common in climate conditions, life forms and physical features like the tundra or woodland

Biostratigraphy - Identification and differentiation of rocks based on the types of fossils they contain

Biotic - Having to do with living organisms

Carbon^{14} – A radioactive form of carbon used to date ancient rocks and artifacts

Carnivore - A flesh/meat eating animal

Characterized - To describe an object or idea

Chlorophyll A - A pigment in plants that give them their green color and which absorb energy from the sun. Plants use Chlorophyll to change carbon dioxide and water into food and oxygen

Classification - Organize into groups or categories

Climate – Typical weather patterns of a region over long time periods

Community - All organisms in a particular environment

Comprehend - Being able to understand

Comprehensive - Conveying or including everything or almost everything

Coniferous woodland - A wooded area that is dominated by evergreen trees

Conifers - A group of woody plant commonly known as evergreen trees such as pine, spruce or fir that bears cones

Connectivity - As something is able to connect or relate with another thing

Core - A part removed from the interior of a mass especially to determine the interior composition

Correlated - A mutual relation between two comparable things

Cumulative - Objects or ideas that add together

Deciduous – A plant that lose their leaves during one season, usually winter

Deducing – To draw a conclusion

Deformation - A measurable change in structure, normally for the worse

Degradation - To reduce something or to place something at a lower level

Delta – The land formed where a river deposited silt as it enters into a larger water body, classic example, the Mackenzie Delta

Dendrochronology - A system of dating wooden objects by studying the tree growth rings

Density - a quantity of mass per unit volume

Discontinuous – Not continuing or linked

Diversion - A changing of the direction an object is going

Ecology - The science that deals with how living organisms live in relation to each other and their environment

Ecological integrity - Ensuring the relationship in plant and animal communities remains healthy

Ecosystem – The organisms present in a defined area and how they interact with the non-living surrounding (the biotic and the abiotic)

Effluent - A pollutant that flows out from a main source, such as sewage or waste matter

Ekman Grab - A box core type of sediment sampling device.

ELC data - Ecological Land Classification data

Electrofishing - Using electricity to stun and kill fish, usually used during scientific scenarios

Electromagnetic - Magnetism that is caused by electricity

Emissions - A water product that is radiated outward or discharged from a source

Environment – An organism's physical surroundings

Epoch - A period of time during which something important developed or happened

Erosion - Group of natural processes (weathering, disintegration, abrasion, corrosion, transportation) where the Earth's surface is worn away and removed

Eskers - A long, narrow ridge of coarse gravel deposited by a stream flowing under a decaying glacial sheet of ice

Estuary - A place where coastal seawater comes into contact with the current of a freshwater stream

Eutrophication – The enrichment of aquatic systems, promoting dense algal and plant growth in a body of water, depriving the water of oxygen and forcing change in species composition

Evolution - A process where different species come into existence by differentiation and genetic mutations from common ancestors over a long period of time.

Excavated - Extracting or revealing something by removal of the surrounding earth

Fauna - Animal life of a particular region, environment, or geological period

Fault - A fracture in a rock along which the rocks move; the place of origination of seismic activity; types include: strike-slip and thrust

Flora - The plants of a particular region, environment or geological region

Fluvial - Pertaining to something's existence or growth around a stream or river

Fossil -Trace of an organism of a past age,

embedded and preserved in the Earth's crust

Fungi - A kingdom of heterotrophic organisms that produce spores

Gender - One's characteristics or traits determined socially as a result of one's sex

Genetic - Pertaining to an organism's traits or characters being linked to genes

Genera - A group of organisms that share common characteristics

Geochemistry - The science that deals with the chemical composition of and chemical changes in the solid matter of the Earth

Geochronological - The chronology of the earth's history as determined by geologic events and not by human history

Geomorphologic - Pertaining to the physical features of the Earth's surface

Grams (g) - A unit of measurement for mass

Habitat - A place where organisms live

Heterogeneous - A situation where something is in a mixed composition

Holocene - The most recent 11,000 years of the Earth's history starting at the end of the last major ice age, which has been relatively warm

Hydraulic - Pertaining to movement caused by water

Hydroacoustic survey - An echo-sounding (SONAR) survey used for measuring such things as fish stocks, water velocity, etc.

Hydrocarbon – A molecule containing hydrogen and carbon, often petroleum, natural gas and coal

Hydrograph - A graph showing the water level, discharge, or other property of river volume with respect to time

Hydrology - Science dealing with the properties, distribution and circulation of water

Igneous - A rock or mineral that solidified from molten or partly molten material, i.e. from magma; one of three rock types with metamorphic and sedimentary

Implement - To put into effect

Iron - A metallic element used for making tools and essential for all living organisms' survival

Kimberlite – An igneous that forms in volcanic pipe, an indicator of diamond deposits

Larvae - A premature stage for an insect where it feeds before becoming a pupa

Latitude - A measurement of the from the equator to a given point on the Earth's surface in the north and south direction

Ligotrophic (oligotrophic) - The opposite of eutrophic. Waters having very low levels of primary productivity and (usually) low concentrations of nutrients; good, clear water quality

Limestone - A sedimentary rock that contains mostly calcium carbonate and can be formed by either inorganic or organic processes

Limnology - The scientific study of the life and phenomena of fresh water, especially lakes and ponds

Lithic - Of, like, or made of stone. Archaeological artifacts made of stone

Metamorphic rock - Any rock derived from pre-existing rocks by changes in response to environmental factors such as temperature and pressure over a long period of time; one of three types of rocks with igneous and sedimentary

Methane - The simplest hydrocarbon that is the main ingredient in natural gas (CH_4)

Microclimate - The climate of a small area that is different due to changes in geography

Microorganisms - Organisms that must be viewed under a microscope, such as bacteria or a virus

Migration - The long range movement of a group of animals based on the seasons

Molecular analysis - A detailed look at the chemical structure and properties of a molecule

Moraine - A mound of rock debris carried and deposited by a glacier

Multicellular – Composed of more than one cell

Nutrient – Any chemical that an organism removes from the environment to aid with growth and development; common nutrients include nitrogen and phosphorus

Organic - Material pertaining to plants or animals

Outcrop - A portion of bedrock or other stratum protruding through the soil level

Overlie - Sedimentary or volcanic rock that lies on top of older rock

Paleoecological - A relationship or study of ancient

organisms and how they related to their ancient environment

Paleoenvironmental - An environment that existed in the past

Parameter - One set of measurable factors, such as the temperature and pressure that define a system and determine its behavior and are varied in an experiment

Permafrost – The permanently frozen layer of soil that characterizes the Arctic's ground; there are two various types: continuous and discontinuous

Pertinent – An object, idea or concept that is relevant to the topic

Phylogeography - The study of the geographic distribution of phylogenetic lineages, usually within species and to reconstruct the origins and diffusion of lineages

Physiological - Pertaining to the physical structures and functions of living organisms

Phytoplankton - A group of plant-like plankton that all sea animals depend on either directly or indirectly

Pingo – A large frozen mound covered with vegetation in permafrost areas

Pleistocene - An age of notable ice ages and development of humans between 2,000,000 and 10,000 years ago

Postglacial - Relating to or occurring during the time following a glacial period

ppm – An abbreviation of parts per million

Precipitation – Water (in the form of rain, snow, hail, etc) falling from the atmosphere

Qualitative – A complete detailed descriptions usually taken from a small sample that allows for distinctions to be drawn from the data

Quantitative - Use of large amounts of data where statistics can be applied to interpret the data

Qiviuq - The soft downy undercoat of muskoxen

Radiocarbon dating - The determination of the approximate age of an ancient object, such as an archaeological specimen, by measuring the amount of carbon^{14} it contains

Raptor - A bird of prey such as an eagle, falcon or osprey

Remote Sensing – A technique used to study locations using technology that does not require the researcher to be in the field

Revitalization - To give new life or vitality to something

Satellite imagery - Computer images generated by a satellite which allow researchers to look at a specific area and monitor surface features such as vegetation

Sediment - Solid fragment material that occurs from the weathering of rocks. In water it is material that has settled from a state of suspension

Sedimentary rock - Rock derived from loose particles that have accumulated over time

Sedimentation - The process where small particles are moved and deposited to accumulate into layers

Seismic - Pertaining to vibrations in the Earth, both natural and induced

Shovel testing - A simple test where a sample of ground is taken by use of a shovel and examined

Species - A group of organisms that share common characteristics that group them together and also distinguish them from others

Stone flakes/chards - debris left over from a rock while making tools

Stratified - A system that is set up in layers or strata

Stratigraphic - Formation of rock where different layers can be picked out based on type and age of the rock

Succession - A progressive change in the biological community as a result of a response from species to the changing environment

Surficial - Pertaining to something that is on the surface

Suspension - A situation where the medium is able to support the weight of the particles trapped inside it, example: silt in a river.

Systematic - Done according to a plan

Thermokarst - Sinking holes, caves and underground drainage that are produced in regions with permafrost from melting of ground ice and settling of the remaining ground

Thermocline - Layer in a large body of water that sharply separates regions differing in temperature. An abrupt temperature gradient in a lake

Topography - A description of the surface of a given area

Trace metals - A metal that is not essential in the sample but is found in small quantities

Transect - An imaginary line across a surface where observations are made

Tributary - A stream or river which feeds into a larger body of water

Turbid - Stirred up material suspended in a medium leaving it unclear and opaque

Ungulate – Hoofed animals

Velocity - Rate of change of position; quickness of motion

Volatile – Unstable; a substance that easily vapourizes

Watershed - A region draining into a river, river system, or other body of water

Weather – Daily variable changes in temperature, precipitation, wind and other atmospheric conditions

Zooplankton - Microscopic animal organisms floating in water

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