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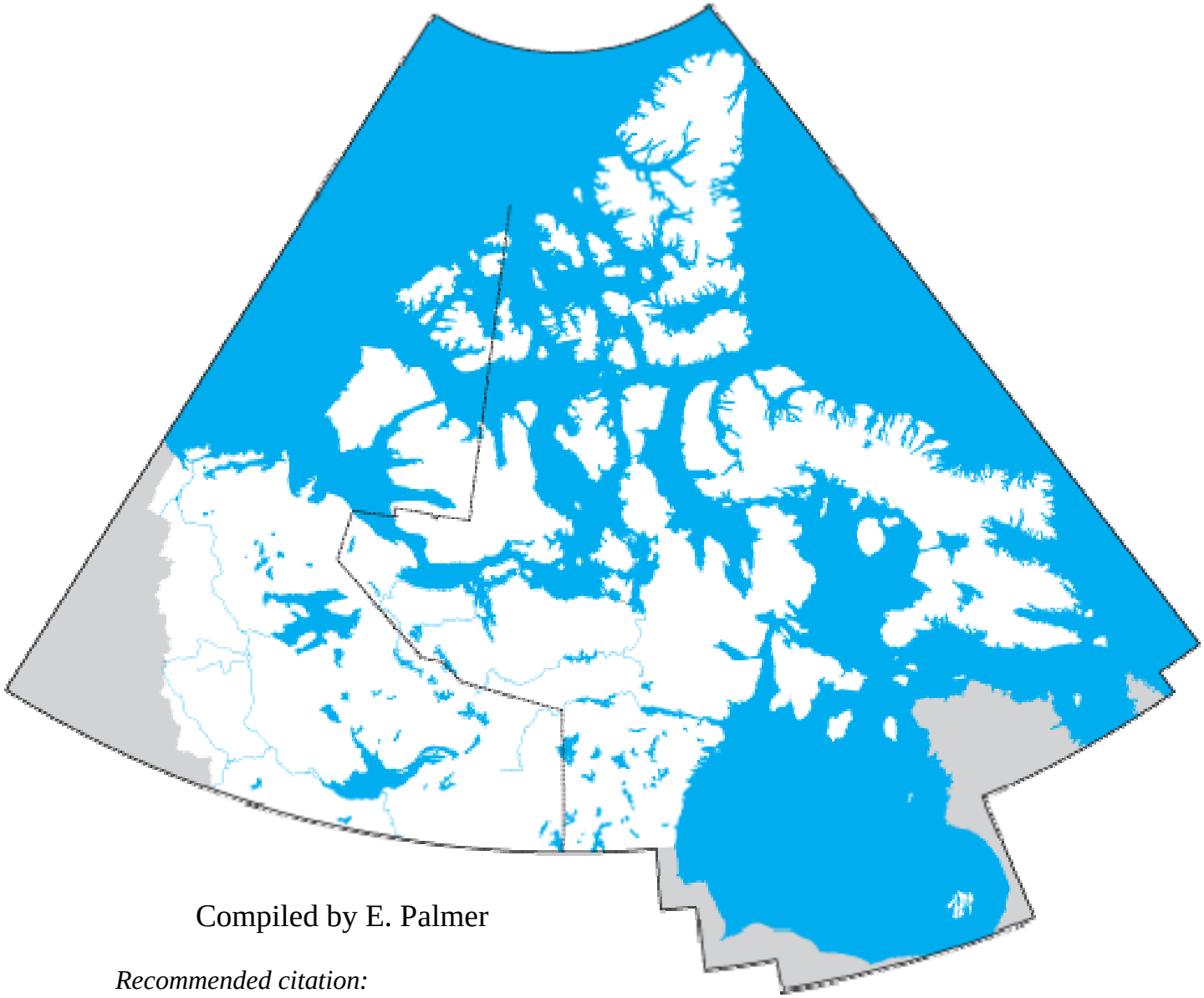

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PROTEROZOIC IRON FORMATION-HOSTED GOLD, CENTRAL BAFFIN ISLAND, NUNAVUT

Armitage, A. and Kahlert, B.
Commander Resources Ltd., Vancouver, BC

The principal exploration target on the Baffin Island Property is an iron formation-hosted gold deposit similar to the Proterozoic iron formation-hosted Homestake gold deposit in South Dakota, USA. Exploration by Commander Resources Ltd. from 2003 to 2005 has resulted in the discovery of 14 gold occurrences over a strike length of 140 kilometres. The 2005 exploration program has significantly expanded the potential for the discovery of stacked, high-grade gold zones on the property.

The property covers the southern rift margin of the Piling Group, a sequence of Lower Proterozoic (ca. 1.9 Ga) supracrustal rocks that form part of the Foxe Fold Belt. The Bravo Lake Formation of the Lower Piling Group is the principal unit of economic interest and is host to the fourteen known gold occurrences including Malrok, Ridge Lake and Durette. The Bravo Lake Formation is comprised predominantly mafic volcanic and intrusive rocks, with clastic metasedimentary rocks and lesser iron formation and sulphidic schist. These rocks have been complexly deformed (thrusting, at least 3 phases of folding), and upper amphibolite grade metamorphism.

Exploration work, including diamond drilling, has discovered at least two separate sheared and mineralized iron formation units within the target Bravo Lake Formation in the Ridge Lake and Malrok prospects. The upper "silicate-facies" is a banded quartz-garnet-amphibole-sulphide iron formation, and the lower "sulphide-facies" is a banded quartz-pyrrhotite iron formation. Gold mineralization, as free gold, occurs within the silicate-sulphide bands and is variably associated with arsenopyrite in silicified and quartz veined iron formation. The timing of the gold mineralization appears to be syn to post D_2 deformation and peak metamorphism.

At Malrok, gold mineralization traced through surface sampling and drilling occurs over a strike length of ~ 2 kilometres. Drilling of the upper silicate-facies iron formation down to 50 metes depth returned assays that included 15.12 g/t gold over 3.0 metres and 12.1 g/t gold over 3.3 metres. The shallow gold zone with local high grade sections extends down-dip from surface for at least 130 metres and remains open along strike and down dip. Drilling to date has not penetrated deep enough to intersect the lower iron formation target.

The Ridge Lake prospect, located 30 kilometres east of Malrok, includes a 3.5 kilometre strike length of both the upper and lower iron formation units within a prominent east-west structural corridor defined by strong folding, locally intense shearing and alteration. Diamond drilling to depths of less than 100 metres was designed to follow-up numerous high grade gold assays in surface samples. Strongly mineralized intervals in the lower iron formation included 21.30 g/t gold over 4.24 metres in a wider interval grading 10.63 g/t gold over 8.89 metres and in another

area, 17.48 g/t over 2.15 metres. In the upper iron formation results included 14.16 g/t gold over 1.62 and 10.24 g/t gold over 1.90 metres.

Durette is located 40 kilometres to the northeast of the Ridge Lake prospect. Work in 2005 identified an intense plumbing system with high-grade gold in a quartz stockwork system hosted by quartzite. Grab samples up to 59g/t gold and channel samples up to 29.8g/t gold over 2 metres identified a minimum 450 metre strike length target. The quartzite unit occurs stratigraphically above the iron formation horizons and represents a third stratigraphic gold target on the property. It is anticipated that the two gold-bearing iron formations will be found at depth at Durette within a very intense mineralized system.

RECENT KIMBERLITE DISCOVERIES ON WALES ISLAND: A NEW KIMBERLITE FIELD IN CENTRAL NUNAVUT.

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Stornoway Diamond Corporation. Vancouver B.C.

Exploration on Wales Island by Stornoway Diamond Corporation, Strongbow Exploration Inc. and BHP Billiton Diamonds Inc. during 2004 and 2005 has resulted in the discovery of 10 kimberlites. These bodies comprise a new kimberlite field situated some 250 km southwest of the diamondiferous Aviat kimberlite cluster discovered by Stornoway and partners; and some 125 km north of BHP Billiton's diamondiferous Qilalugaq kimberlite cluster. Two kimberlites (W1 and W3) were discovered by the Wales Island joint venture in 2004. The 2005 exploration program, consisting of exploration drilling, ground geophysical surveys and till sampling, resulted in the discovery of eight new kimberlites. Five were intersected by drilling and three narrow subcropping dykes were discovered by prospecting. A total of 20 ground geophysical grids have been completed in 2005. Nineteen BQ holes were completed for a total of 1366m of drilling. Approximately 708kg of drill core and 70kg of surface subcrop material were collected for caustic fusion analysis to determine diamond potential. Kimberlites have been emplaced through Ordovician/Silurian-aged dolostones and depth to the Archean basement is unknown. Preliminary results of ongoing geochemical, geochronology, and petrographic studies will be presented.

Kimberlites W111 and W2 are located approximately 5.5 km apart along a distinct east trending structural feature that extends across the property for a distance of 14 km. A linear magnetic high delineated by airborne geophysics is associated with this break and is also evident in the ground geophysical data from both W2 and W111, suggesting that kimberlite magmas may have exploited this regional feature.

Three parallel kimberlite dykes, each with apparent widths of greater than 0.5 m, and some 20 m apart laterally, were discovered about 200 m west of kimberlite W1. The dykes can be traced in subcrop over a distance of 110 m, and by ground geophysical techniques over a total of 300 m. The strike extent of the dykes remains open both to the west and east of W1. These dykes were

not drilled but are interpreted as part of an easterly-trending kimberlite dyke complex along which W1 may represent a kimberlite pipe or blow.

Three additional kimberlites discovered by drilling (W9, W10, W47) returned kimberlite intersections ranging up to 30 metres. Three other geophysical targets were drill tested (one hole each), however kimberlite was not intersected and these targets remain unexplained.

The Wales Island Project comprises a 300,000 acre land package on an island located in Committee Bay just west of the Melville Peninsula. Exploration of the Wales Island Project is governed by a joint venture agreement between Stornoway, Strongbow and BHP Billiton. Each partner retains an equal one third interest in the project, and Stornoway is the project operator.

SEABED FEATURES IN THE BEAUFORT SEA AND THEIR IMPACTS ON OFFSHORE HYDROCARBON DEVELOPMENT AND THE ENVIRONMENT

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(4) Canadian Hydrographic Service, Burlington, ON

In August-September 2005 the Geological Survey of Canada in collaboration with the Canadian Hydrographic Service and ArcticNet conducted a seabed mapping program from the Canadian Coast Guard vessels Nahidik and Amundsen. Research in the Beaufort Sea has been focused on investigating geoenvironmental and engineering issues related to offshore hydrocarbon exploration and transportation. These issues include ice scour, seafloor instability, sediment mobility, and shallow/sub-surface gas. Multibeam sonar, sub-bottom profilers, sediment corers (piston, box, and gravity), side scan sonar, and seismic reflection profilers were used to investigate the seabed of this region.

Of the 212 new ice scours mapped on the seabed in 2005, nine were extreme events with scour depths ranging from 2.0 to 3.4 m and 15 were generated by large pressure ridges with keel depths of 25.1 to 27.1 m. Gas vents first mapped in 2001 were observed to be infilled in 2004. The features were resurveyed in 2005 and the results show the vents to be active as the infill had been blown out. Comparison of 2004 multibeam data collected over the Gary Knolls mud volcanoes with new data collected over the same area in 2005 indicates that at least 1 of the 97 features grew by 30 cm over the last year. Whale maw marks in the seabed indicate possible bottom feeding by bowhead whales in the same area as the mud volcanoes. Two surveys (2001 and 2005) of the abandoned artificial island Nipterk L-19 indicate that the island is still actively eroding after 20 years and has migrated 32m southeastward in the last 4 years.

A 9 km wide and 70 m deep submarine slump scar located on the Beaufort Shelf edge in about 250 m water depth, first mapped in 1981, may have occurred as a result of downslope creep failure. The slump has steep sides (up to 70m high) and appears to be recent, probably due to the low sedimentation rate in this area which has preserved the feature. This slump may be 10,000 years or older due to observations in sub-bottom profiles near the slump. These profiles show recent undisturbed Holocene sediments up to 10m thick draped over older deformed strata. Radiocarbon dating of recovered sediment core samples suggests the slump is older than 4700 cal years BP. The slope failure may have occurred during the last glaciation when sea level was over 100m lower and sedimentation rates were higher. The shelf edge was a much more dynamic environment at that time and more conducive to slope failure.

A new digital multichannel receiving array successfully imaged both shallow gas and permafrost in the sediments below seabed. Additional sediment samples were acquired to determine the variability of physical properties caused by ice scour. Diversity and abundance of benthic macrofauna was assessed along a depth gradient from 5m to 170m on two transects. Preliminary analysis reveals differences in benthic community composition along the depth gradient with a positive correlation between species richness and depth.

DEVON'S PAKTOA, NEW DRILLER IN THE OFFSHORE BMB (BEAUFORT MACKENZIE BASIN)

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Devon Canada Ltd has mobilized the SDC drilling platform to the central BMB in preparation for the drilling of the Paktoa prospect in the winter of 2005-2006. This well represents the first drilling in the offshore BMB in 15 years, and is a significant milestone in the evaluation of Devon's EL 420 in the offshore Beaufort Sea. The SDC (Steel Drilling Caisson) is the former Dome SSDC, a converted oil tanker that was mobilized from the Herschel basin in late summer and placed on location awaiting freeze-up. The well is planned for the winter season, which provides a longer drill season as well as mitigating environmental and operational risks.

The exploration well is planned to 2350m and will test the Kugmallit and Taglu intervals that are productive elsewhere in the basin. Drilling operations are anticipated to commence at the end of December, with completion of drilling in early February. Testing and completions will follow, as dictated by well results. The Paktoa prospect is a flank shale diapir play that is previously untested in the BMB, but proven elsewhere. Devon's proprietary 3D seismic has been able to image the shale diaper, and the large closures of prospective reservoir sands on its flanks. The reservoirs are stacked, providing multiple targets for each exploration well. The Kugmallit and Taglu zones are proven productive in the immediate offset wells and represent the primary reservoirs in the major discoveries to date in the Mackenzie Delta.

A successful well would help prove up the larger Paktoa-Tiggak complex. A preliminary development scenario envisions a sub-sea template with tie-backs to a central production platform and a sales pipeline to the onshore MVP gathering system. Stay tuned, it should be an interesting winter!

CHARACTERIZATION OF FUEL CONTAMINATION IN A FRACTURED BEDROCK PERMAFROST ENVIRONMENT

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The Colomac mine is currently undergoing significant remedial work under the oversight of DIAND. As part of this effort, fuel tanks have been deconstructed and the impacted overburden from the tankfarm area excavated for treatment in a biopile. Residual contamination is present in the underlying bedrock. One problem that is still being studied to develop a more effective remedial plan is the fate and transport of spilled fuel in the fractured bedrock underlying the site. Three areas of concern have been identified:

- the old tank farm where significant diesel has been observed,
- the area of former gasoline pumps to fill vehicles, and
- an area adjacent to the former power house.

To better understand the flow field and groundwater geochemistry detailed sampling and testing was conducted from June to September, 2005 including the following:

- Weekly water level measurements in approximately 35 monitoring wells to measure free product thickness, depth to water, and depth to ice in the bottom of the well,
- Installation of level loggers in 5 wells to observe water table fluctuations with time in greater detail,
- Weekly water samples from approximately 14 wells to measure inorganic chemical concentrations as the active layer thawed and the water depth changed,
- Periodic bail tests to determine free product recovery in select wells,
- Packer tests conducted in 10 wells over 0.56m intervals to obtain hydraulic conductivity versus depth profiles,
- One round of sampling to obtain petroleum hydrocarbon concentrations in some wells where inorganic sampling had been conducted, with some of this sampling done using the packer system to examine contamination versus depth profiles.

The active layer depth in the monitoring wells was highly variable. Two wells were thawed to depths of more than 20m in June, and 5 wells in August. In June, one of these was adjacent to a heated warehouse, but the other was near a lake's edge. Other wells near the lake did not show such a deep thaw depth, however. In August, all 4 wells adjacent to the warehouse had thaw

depths in excess of 21 m. Median thaw depths in June (excluding those around the warehouse) were approximately 4-5m, and were 7-8m in August.

The monitoring wells were cased through the overburden, but were uncased in the bedrock. Hydraulic conductivities in the bedrock ranged from 3 x 10^{-5} m/s to being too tight to measure at depths greater than approximately 4.5m in some wells, but not others. Median values were approximately 4x10^{-6} m/s.

Total dissolved solids in the groundwater ranged from 100-1200 mg/L, with an average value of 600 mg/L. The groundwater is dominated by calcium, sulfate, and bicarbonate, with minor amounts of sodium, potassium, iron, manganese, and small amounts of chloride. The iron and manganese were obtained from field filtered and acidified samples, indicate a reducing environment even upgradient of the contamination, which was surprising given the shallow nature of the site.

Dissolved hydrocarbons were found in all wells sampled but one. However, many of the wells contained free product during 2005, so concentrations obtained from these wells are questionable. In wells with no free product in 2005, CCME F1 fractions (n-C_6 to n-C_{10}) varied from 30 ug/L to a high of approximately 3500 ug/L, with a median value of approximately 400 ug/L.

MINING AND SOCIOECONOMIC DEVELOPMENT IN NUNAVUT: LEARNING FROM POLARIS AND NANISIVIK

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Nunavut has gained importance in the last few years as an area of high mineral potential. Exploration has led to the discovery of several promising mineral deposits, one of which will become Nunavut's first diamond mine: Jericho. As a territory with an economy based in large part on government employment, this new mine and potential future mining operations can provide Nunavut with an alternative way to develop its economy through job creation, local business opportunities, royalties, and taxes. Mining can also provide the people of Nunavut with the opportunity to be trained for various jobs that can later be used for employment with community-based businesses. Understanding the socioeconomic impacts of past Arctic mining operations, such as the Polaris and Nanisivik Mines, becomes important if the above opportunities are to become reality and if Nunavut is to benefit as much as possible from future mining operations.

The Polaris and Nanisivik lead-zinc mines closed in 2002 after over 20 years of operation. Each mine was located near an Inuit community: Polaris, located 100km northwest of Resolute, was a fly-in fly-out operation that used Resolute as a staging point; and Nanisivik, a community-based operation, is connected to Arctic Bay by a 21km long all-weather road. The differences in the

physical connections of the mines to Inuit communities provide a good opportunity to compare and contrast their socioeconomic impacts on each community.
This qualitative study uses company and government reports and the data from 51 interviews, conducted over a 4-week period in January-February 2005 with residents of Resolute and Arctic Bay, to determine the various socioeconomic impacts of the mines, and to make recommendations for the future success of local social and economic development from mining in Nunavut.

The economic impacts of the mines vary and depend on the economic situation of each community before the arrival of the mines. In both Resolute and Arctic Bay employment at the mines was the main economic impact and injected significant amounts of money into the communities through salaries. Business partnerships were formed in Resolute between Polaris and preexisting businesses whereas in Arctic Bay, three new businesses were created because of Nanisivik and its airport. All businesses did well while the mines operated. Mine closure has affected the communities differently. Resolute businesses have lost revenue but remain open, while one of the businesses in Arctic Bay has closed due to the shutdown and the other two will be negatively affected by the planned closure of the Nanisivik airport.

The social impacts of the mines are similar for both communities but also vary based on the proximity of each mine to its respective community, with Arctic Bay residents being impacted more by Nanisivik than the residents of Resolute by Polaris. Residents of both communities wanted the mines and government to maintain better contact with each community and communicate more effectively, to promote education and job training, to adhere to agreements, and to allow them a more prominent role in mine development and production decisions affecting their communities.

GANFELD: A GEOSCIENCE DATA COLLECTION SYSTEM

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The inter-relationship between computers and geologic data has moved out of the office and into the field over the past few years. With the continued development of pocket computers, electronic field data collection has become more accepted as these devices have become more reliable for the rigors of fieldwork. Ganfeld, a field data collection system, was used with great success by both bedrock and surficial geologists last summer. The following talk will show some of the background of the work that has been carried out at the Geological Survey of Canada, as well as give a demonstration of the most recent application used this past summer.

PINE POINT, A BRIGHT FUTURE.

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Tamerlane Venture's 175 square kilometer Pine Point Property is located forty kilometers east of Hay River on the south shore of Great Slave Lake. It has historically produced 64 million tonnes of ore containing 2 million tonnes of lead and 4.5 million tonnes of zinc which, at current metal prices, would be worth approximately US$8 billion. The remaining resources on the property, taken from historical documents, total 70 million tonnes at a grade of 1.6% lead and 4.2% zinc. Within the historical resource there is a higher grade portion, which totals approximately 20 million tonnes, that has a grade equivalent to the historical mine grade.

The Pine Point Property has excellent infrastructure for the development of a new mine because although the town and mill were removed the road to the property is paved and the Talston Dam, which provided power to Pine Point Mines Ltd., is currently being used at only a small portion of its capacity. The removal of the town is of enormous benefit as any new mine development can use a bunkhouse operation.

The lead-zinc deposits are located within the Middle Devonian Pine Point Formation, a reef complex that separated an evaporate basin to the south from the open sea to the north. The reef complex is several hundred miles long and plunges gently south-west to the Rockies. The deposits are hosted in paleo-karst caverns (prismatic deposits) and streams (tabular deposits) which are surrounded by zones of extensive dolomitization which has been called the Presquile at Pine Point. Mixing of metal rich brines derived from the shales north of the reef with sulphur-laden fluids from the evaporitic basin are thought to have precipitated the mineralization in the karst openings.

In addition to the known resources there are excellent exploration targets on the Pine Point Property. The 15-km. zone between N-81, the last deposit mined, and the Westmin property has only been lightly explored and only one deposit has been located there. The normal discovery frequency is one deposit per kilometer of strike so this zone is an excellent exploration target. The deposits located by Westmin, which lie on strike to the west of this zone, were never mined and there remain good follow up drill targets on this portion of the property.

The W-85, GO-3, R-190 and N-204 deposits alone contain in-situ metal values in excess of one billion dollars ($US) and the demand for base metals is anticipated to be strong for the next five to seven years. Tamerlane plans to put Pine Point back into production within a 24-month period and is currently completing confirmation drilling on the W-85, the GO-3 and the R-190 deposits. This drilling has yielded excellent results with the best hole from R-190 returning 105 feet of 31% combined lead-zinc. Tamerlane is completing baseline environmental studies, negotiating a protocol agreement with the First Nations and Métis of the area and plans to complete a bankable feasibility study this before the summer of 2006.

ND AND U-PB ISOTOPIC EVIDENCE FOR CRUSTAL EVOLUTION IN THE WECHO RIVER AREA, SOUTHWESTERN SLAVE PROVINCE, NWT

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The Wecho River area, located in the southwestern Slave Province, approximately 100 kilometres north of Yellowknife, NT, is dominated by Neoarchean granitoid rocks with lesser amounts of meta-sedimentary and associated mafic volcanic rocks. The igneous rocks are divided into four groups based on their major element, trace element and isotopic compositions, and their ages. Group A rocks consist of the ca. 2650 Ma mafic volcanic rocks that range from highly sheered basalt to layered mafic volcaniclastic rocks. These rocks have low positive Epsilon Nd values between +0.94 and +2.70 indicating a dominantly depleted mantle source. Group B rocks are metaluminous granodiorites, diorites, and tonalites that range in age between ca. 2601 and 2608 Ma. They have Epsilon Nd values between +1.2 and -7.58 and are comparable to the pre- to syn-deformational granitoids described in the Western Plutonic Complex. Inherited zircon greater than 2800 Ma within one of the suites in this group provide direct evidence that Central Slave Basement Complex age crust played a role in the genesis of the suite. Group C rocks include ca. 2600 to 2591 Ma weakly metaluminous to peraluminous granodiorites and granites. They are correlated with the syn- to post-deformational granitoids common across the Slave Province and have Epsilon Nd values ranging between +0.66 to -1.76. Group D is the ca. 2592 Ma Dauphinee suite, a mafic granulite to enderbite with Epsilon Nd values of +0.40. This group has different rare earth element and major element geochemical characteristics compared with those of the Group C magmas that classify it in a separate group. It may however be related to the Group C magmas in that it could have provided the heat source required to produce the voluminous late Archean granites. The Nd isotopic data, major element and rare earth element data show a clear difference between the older Group B magmas and the younger and compositionally different Group C and Group D magmas, which indicates a significant difference in the petrogenesis of the older and younger groups.

The Nd isotopic data are consistent with the presence of ancient crust beneath the eastern side of the Wecho River area at the time of 2.6 Ga granite production. In the westernmost portion of the map area, Epsilon Nd values for all rocks are positive, indicating that there was likely no ancient crust involved in their petrogenesis. In the central part of the map area the Epsilon Nd values are weakly positive to slightly negative suggesting contributions from both an ancient crustal source and a more juvenile source during the formation of the central area granitoids. The Central Slave Basement complex is thus interpreted to extend into and terminate within the Wecho River area.

PEREGRINE FALCON SURVEYS IN THE NORTHWEST TERRITORIES

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The Anatum Peregrine Falcon (Falco peregrinus anatum) is listed as a Threatened and the Tundra Peregrine Falcon (F. p. tundrius) is listed as Special Concern species under the federal Species at Risk Act. Since 1970, agencies working in the Northwest Territories have performed Peregrine Falcon surveys and, since 1985, have participated in the Five-year North American Surveys. One of the primary purposes of these surveys has been to periodically monitor peregrine falcon populations in North America, continent wide, to determine trends and the outcome of recovery efforts. In the NWT, this effort is complementary to annual monitoring done by industry on the Barren-grounds, and to surveys done by Parks Canada in some of NWT's National Parks.

Peregrine falcon numbers have increased across North America since the ban of DDT use in most countries. DDT and DDE caused eggshell to thin and by 1960s and 1970s had greatly reduced productivity of Peregrine Falcons by decreasing hatching success. Surveys in the Northwest Territories show that most old historical sites have been re-colonized by the mid-1990s. Productivity varies greatly from survey to survey. Results of the 2005 surveys and possible causes for large variation of productivity for northern-nesting Peregrine Falcons will be discussed.

BARREN-GROUND CARIBOU POPULATIONS - CYCLES AND CONSEQUENCES

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Recent surveys of barren-ground caribou (Rangifer tarandus groenlandicus) herds in the Northwest Territories (NWT) indicate that the size of all the herds surveyed has declined since the late 1990's. This presentation will provide an overview of barren-ground caribou monitoring and management in the NWT. It will look at how factors such as climate, weather, insects, predation, disturbance and harvest act to influence barren-ground caribou herd size. The presentation will also look at the implications of declining caribou numbers to users of barren-ground caribou and barren-ground caribou ranges.

THE APPLICATION OF WESTERN SCIENCE, TRADITIONAL KNOWLEDGE AND BEST PRACTICES TO THE DEVELOPMENT OF MINE SITE RECLAMATION GUIDELINES FOR THE NWT

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In the early 1980's, the Northwest Territories Water Board and the Department of Indian Affairs and Northern Development (INAC) began to include a condition that an Abandonment and Restoration Plan be prepared and submitted for approval as a requirement of water licenses and land leases. In 1990, the Technical Advisory Committee (TAC) of the Water Board in conjunction with staff of the INAC Land Resources Division drafted the Guidelines for Abandonment and Restoration Planning for Mines in the Northwest Territories, 1990.

The Mine Site Reclamation Guidelines (2005, draft) update and expand on reclamation processes and procedures introduced in the 1990 Guidelines for Abandonment and Restoration Planning for Mines in the Northwest Territories and are intended to compliment the Mine Site Reclamation Policy for the Northwest Territories, 2002. The purpose of the guidelines is to:

- Inform Aboriginal, Federal and Territorial governments; land owners; local communities; regulatory authorities; mining proponents; and other affected parties of INAC's expectations regarding Closure and Reclamation Plans;
- Provide internal guidance to INAC staff in the development of regulatory terms and conditions; and,
- Provide INAC staff guidance in the preparation of interventions and the review of documents for resource management boards.

The guidelines will apply to:

- Closure and Reclamation Plans for new and existing mines; and,
- Closure and Reclamation Plans where required for exploration and advanced exploration ventures.

The guidelines are formatted into two parts; Part 1 describes the primary concepts and general information that applies to the reclamation of all mine sites in the Northwest Territories. It provides information on the Closure and Reclamation Plan summarizing what is expected in a Closure and Reclamation Plan, and how the expectations change during each stage of mine development. Part 2 offers direction on the technical aspects of closing and reclaiming mine sites. They were developed in consultation with Aboriginal community members, scientific experts, mine representatives, regulatory authorities, and other affected parties. Consultation took the form of workshops, technical meetings, one-on-one interviews, and written comments.

The first workshop was held February 1-3, 2005 in Yellowknife. In attendance were Directors of Independent Environmental Monitoring Agency (IEMA) and the Environmental Monitoring Advisory Board (EMAB), Aboriginal members, and representatives from both the mining industry and government. Attendees shared ideas on the objectives, issues, options, and measures of success for inclusion in mine closure and reclamation plans. At the end of the workshop participants had a general understanding of the issues and concepts associated with reclaiming common mine site components.

Scientific technical reviews of the draft guidelines were conducted by experts in various reclamation-related fields. The reviews focused on issues, technologies, and conditions pertinent to reclamation in northern climates. The reviewers then participated in a 3 day work-out session in Yellowknife May 9-11, 2005 to discuss outstanding issues and to share ideas on ways to improve the document. At the end of the 3 day session, information was gathered to update the guidelines with technically sound and modern strategies for mine site reclamation.

After witnessing the wealth of knowledge and interest Elders hold on the topic of reclamation at the Mine Reclamation Workshop in Yellowknife, it was decided that a more in-depth approach should be used to capture this knowledge and apply it to the guidelines. As a result, interviews were conducted with 15 Elders from diamond mine impacted communities during March-May of 2005. On May 16th and 17th Elders, community lands and resources representatives and INAC representatives met to discuss and build on information gathered from the interviews. The participants had many specific suggestions for what could be done to the land to promote reclamation. Final reports were prepared for the interviews and the workshop, and the findings were used to update the draft mine site reclamation guidelines with applicable Traditional Knowledge.

BOREAL WOODLAND CARIBOU CONSERVATION IN THE NORTHWEST TERRITORIES

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The decline of boreal woodland caribou (Rangifer tarandus caribou) numbers in much of Canada has led to their listing as threatened in 2004 under the federal Species at Risk Act. In the Northwest Territories (NWT) boreal caribou are spread over the land in low numbers. Their biology makes them particularly sensitive to human activities that could lead to a population decline. Boreal caribou are also a valuable economic and cultural resource to NWT residents as their meat is used for food and their hides are used for clothing and other crafts. To conserve and recover boreal caribou populations and their habitat across Canada, a national recovery strategy is being developed. Under this national strategy, the Government of the NWT (Department of Environment and Natural Resources) is developing an action plan for the conservation of boreal caribou in the NWT. This plan seeks to identify and manage current and potential threats to boreal caribou in the NWT. Potential threats include habitat change and loss, changes in predator and prey abundance, wildlife and climate change, parasites and diseases, vehicle collisions and harvesting. One significant challenge is identifying and managing impacts from oil and gas exploration and development. Other activities like forestry, tourism, mining, and agriculture, and their interactions with each other through cumulative effects must also be considered. With these land management concerns and the Species at Risk Act requirements, the

need for government, communities, co-management boards, and industry to work together to manage boreal caribou and their habitats in the NWT is discussed.

MOVEMENT PATTERNS OF WOLVES ON EXTENDED TRIPS ON THE TUNDRA

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Many tundra wolves (*Canis lupus*) that follow migratory barren-ground caribou (*Rangifer tarandus groenlandicus*) in the Northwest Territories and Nunavut, Canada, break away between May and September for denning. During this time, breeding adult wolves adopt a central place foraging strategy because they must return to the den to feed pups. Often the adult male travels extensively and may not return for days. We describe patterns of these extended trips for satellite collared wolves since 1997. Initially, wolves were monitored with ARGOS collars but Global Positioning System (GPS) collars deployed in the Lac de Gras area afterward provided accurate locations at 30 minute intervals during summer. Journeys (>48 hrs away from the den) are distinctive from the normal cluster of locations around the summer home range and consistent with the locations of large post-calving aggregations of caribou. We describe these journeys and employ various techniques to interpret movements. We attempt to identify moving, resting and predation states with the GPS location data. Identifying characteristics of movement behavior during foraging trips can assist with identifying kill sites during these trips and likely when wolves forage within their normal summer home range. Estimating summer predation rates on caribou by wolves with this technique is discussed.

MONITORING THE RECOVERY OF A TAILINGS LAKE AT COLOMAC MINE AFTER TREATMENT WITH PHOSPHORUS

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The additional of a common fertilizer, MonoAmmonium Phosphate, was used to stimulate the growth of algae in a phosphorus deficient gold mine tailings pond at Colomac in 2002. In conjunction with other water management activities, the phosphorus treatment enhanced the natural rate of contaminant removal. It is expected that all water quality objectives will be met prior to the wastewater discharge in 2008.

A variety of monitoring plans were implemented for Tailings Lake in 2002 to measure the effectiveness of treatment. These plans included: regular water collection at depth to measure rates of contaminant removal and to permit water quality predictions; the installation of thermister strings and a weather station, to measure lake turnover and storm event mixing; the measurement of biomass production, algae species identification and population to evaluate lake system change; the use of sediment traps to capture algae sedimentation for estimating contaminant removal and to determine the importance of P and N recycling during winter; and the implementation of a tailings sprinkler system, as a wet dust suppression method, to limit the impact from wind blown tailings.

Significant results for the individual monitoring plans will be presented. When considered in combination, the results for the physical, chemical and biological monitoring plans indicate that the addition of phosphorus is an effective means to achieve lake recovery and to meet water quality objectives for discharge to the Colomac environment.

PROSPECTIVE IRON OXIDE CU-AU (AG-U-CO-BI-NI) SYSTEMS ALONG THE 400 KM GREAT BEAR MAGMATIC ZONE, WOPMAY OROGEN, NORTHWEST TERRITORIES

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Host of the two known Canadian iron oxide copper-gold (Ag-U-Co-Bi) (IOCG) deposits (i.e., NICO and Sue Dianne), the southern Great Bear Magmatic Zone (GBMZ) is now Canada's premier IOCG setting. Its counterpart, the northern GBMZ, is also emerging as a green-field exploration target for IOCG deposits. The latter area is known to combine past-producing vein-type U-Ag-Co-Cu mines, spectacular but weakly mineralized pyrite gossans and Kiruna-type alteration zones (e.g., Contact, Balachey and Rainy lakes and Port Radium areas). In economic polymetallic IOCG deposits, a common characteristic is the presence of regional-scale sodic-calcic (e.g., Kiruna-type albitization and amphibole-magnetite-apatite assemblages) or potassic alteration upon which iron-rich alteration is superimposed. This commonly includes magnetite ± biotite and a main polymetallic ore zone associated with potassium-iron alteration in which either sericite or K-feldspar prevail as the potassic phase (e.g., K-feldspar–hematite veins or hematite-sericite-chlorite-carbonate, ±Fe-Cu sulphides, ±U, ±REE minerals, etc.). Because of this trait, geological mapping is a key factor for sound IOCG exploration.

For this study, three IOCG mineralized systems were examined near Contact, DeVries and Fab lakes in the GBMZ. These areas were selected as examples to gain a better understanding of the prospectivity of Canadian Proterozoic granitic terranes and to test the suitability of available geological knowledge to support the emerging exploration plays within the GBMZ. At Contact Lake, detailed geological mapping led to significant refinement of the spatial distribution of albite and actinolite-apatite-magnetite alteration, timing relationships with respect to the adjacent monzodiorite intrusion, and delineation of extensive zones of potassic, hematite and chlorite-

epidote-carbonate-sericite alteration. Additional alteration observed includes tourmaline, quartz, hematite and/or manganese veins, large siliceous sulphide-bearing zones, and hydrothermal breccias. A remarkable hydrothermally altered and mineralized diatreme was also identified. Grain-coarsening alteration processes that mimic igneous rock textures highlight some potential problems in mapping. Overall, with its extensive exposures of non-penetratively deformed intensely altered rocks that permit one to characterize overprinting relationships, the Contact Lake area provides classic examples of polymetallic IOCG alteration superimposed on host rocks initially devoid of significant iron oxides. In contrast, DeVries Lake mineralizing systems overprint ironstones in Treasure Lake-type metasedimentary rocks, comprise pre-, syn- and post-deformation alteration, and belong to a distinct IOCG sub-type. The presence, west of DeVries Lake, of pervasive replacement of fragmental volcanic rocks by sodic-calcic and magnetite alteration points to a potential unconformity between Great Bear–related volcanic rocks and Treasure Lake Group. At the NICO deposit, such an unconformity contributed to the localization of ore. At Fab Lake, a unit formerly mapped as conglomerate is best interpreted as hydrothermal breccia. This new data underscores the potential of the Great Bear Magmatic Zone for more than one sub-type of polymetallic IOCG deposits and the importance of targeted mapping in support of exploration.

URANIUM EXPLORATION ACTIVITIES IN NUNAVUT

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2004 marked the start of a significant increase in the price of uranium. By the year end, prices had increased over 250% from US$11/lb to US$29/lb. The upward trend continues in 2005. Explorationists have been drawn back into the uranium search, particularly within Canada. Seventy-five years after the discovery of radioactive minerals in the Great Bear Lake area, the Territories north of 60^{o} are experiencing their fourth wave of uranium exploration interest. This year Nunavut experienced a significant increase in the number of uranium projects and related expenditures. An estimated $16 million will be spent in 2005. Companies are focussed on the Hornby Bay and Thelon Proterozoic Basins. Regulatory clarification efforts are underway by Nunavut authorities in response to the resurgence in uranium exploration activities.

The Hornby Bay and Thelon Basins are similar geologically to the Athabasca Basin of northern Saskatchewan. The Athabasca Basin hosts world class uranium deposits, contributing over 20% of the world's uranium output.

In light of an increased understanding of the geological environment, application of more refined geophysical techniques, and increased commodity prices, companies are re-visiting Nunavut's Hornby Bay and Thelon areas. Unconformity vein-type mineralization and mineralized sandstone boulder trains are being re-examined. Six companies were active within Nunavut in 2005 - three in the Hornby Bay Basin and three in the Thelon Basin. Highlights of their 2005 programs and plans for 2006 will be discussed.

THERMAL STRUCTURE OF DIAMONDIFEROUS MANTLE: EVIDENCE FROM THE DIAVIK DIAMOND MINE

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Fragments of the Earth's mantle transported to the surface by kimberlite magmas are the only direct source of information from deep lithospheric upper mantle. Mantle samples recovered from the A154 North and South kimberlites at the Diavik diamond mine reveal the dynamic thermal history of the underlying diamondiferous mantle. Four dominant lithologies of mantle xenoliths were recovered. The most abundant is eclogite, followed by lherzolite, websterite and rare harzburgite. Websterites, like eclogites, classify as pyroxenites but because of their olivine bearing nature and elevated Cr in garnets the websterite xenoliths from Diavik may be considered transitional between peridotite and eclogite. Similar to other cratonic regions, there are both porphyroclastic (sheared) and coarse textural lherzolites and harzburgites. Sheared websterites are not observed. Thermobarometric calculations based on the mineral chemistry of lherzolite samples indicate that the subcontinental lithospheric mantle beneath the Diavik kimberlites has a paleogeothermal gradient corresponding to 40-42 mW/m^2 surface heat flow, similar to the thermal conditions reconstructed for the Kimberley region of the Kaapvaal craton. The sheared lherzolites are at slightly higher temperatures at any given pressure compared to the coarse varieties, but a distinctly inflected geotherm is not supported by these data.

The thermal history of the websterites is more complicated. Exsolution lamellae in clinopyroxene and Fe-Mg zoning in garnet indicate that the websterite xenoliths have cooled over time.,Fe-Mg exchange thermometry between orthopyroxene and garnet cores allows (minimum) estimates for the original temperature of formation before cooling and two-pyroxene thermometry employing clinopyroxene hosts and exsolved orthopyroxene lamellae provides the temperature at which the websterites re-equilibrated after cooling to place. Results indicate that the websterites initially equilibrated along a 40 mW/m^2 geothermal gradient, i.e. under conditions similar to the peridotite xenoliths, but subsequently cooled by at least 100 to 150°C.

The petrogenesis of websterites beneath Lac de Gras may include some form of modal modification of lherzolite through interaction with melts or fluids. Carbonated fluids or melts derived from a subducting slab could be responsible for conversion of peridotite to websterite. A slab derived Ca-carbonatitic melt would react with olivine to produce clinopyroxene and Mg-rich carbonatite. Thus, the Diavik websterite xenoliths may represent the wall rocks of sills or dykes, formed by slab derived melts, marking their transit through the lithosphere. The thermal history recorded by the websterites is consistent with evidence for cooling of similar extent observed in diamond inclusions at Panda. Combined with previously published data for xenoliths from the Jurassic Jericho kimberlite and shallower, predominantly harzburgitic xenoliths from Lac de Gras, it appears that the 40-42 mW/m^2 geothermal "gradient" recorded in peridotite xenoliths reflects re-heating penecontemporaneously to Late Cretaceous-Eocene kimberlite activity. It is not yet understood, why this late thermal perturbation is not recorded in the websterite xenoliths.

EXPERIENTIAL SCIENCE 10-20-30, A NEW PATHWAY FOR NWT HIGH SCHOOL STUDENTS

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The Department of Education, Culture and Employment, for the NWT, is currently developing a new pathway for high school science education called Experiential Science. These courses, offered at grades 10, 11 and 12 respectively, are designed to engage students in hands on learning while applying scientific knowledge, processes and protocols in a context based learning environment. The program of studies is designed to appeal to a wide variety of students by providing learning opportunities that engage their own learning style. The curriculum for Experiential Science integrates Western science and Aboriginal knowledge and principles through field and laboratory experiences and applications. The program of studies investigates ecology and geology through the systems approach. Each course has a specific focus: Grade 10 - Arctic and Subarctic Terrestrial Systems; Grade 11 - Arctic and Subarctic Marine Systems; and Grade 12 - Arctic and Subarctic Freshwater Systems. A balance between classroom and field investigations allows students to learn in a dynamic environment, which fosters a better understanding of ecological and geological principles and processes.

MEADOWBANK GOLD PROJECT, NU: THE FUTURE IS LOOKING GOOD AN UPDATE ON 2005 ACTIVITIES

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The Meadowbank gold project is located 70 km north of the community of Baker Lake, in the Kivalliq District of Nunavut. Cumberland Resources Ltd. has been exploring the project since 1994 and through systematic exploration and persistence has brought the project to its current development stage. Over the course of 10 years of exploration Cumberland has increased the resources on the Meadowbank project from its original 200,000 oz. mineral inventory to a present resource of 3.8 million ounces in all categories. The project is host to four known gold deposits in a 30,000 ha package of mining leases and exploration concessions. As currently defined, these deposits host measured and indicated resources totaling 23.3 Mt grading 4.4 g/t gold for a contained 3.33 Moz gold. The property hosts additional inferred resources of 3.5 Mt grading 4.2 g/t gold. The recently completed Bankable Feasibility Study defined proven and probable open pit mining reserves of 21.9 Mt of ore grading 3.93 g/t gold for 2.77 Moz contained gold within this resource, having a remarkable discovery cost of US$12 per ounce. The current mining plan calls for an 8.3 year mine life from three closely spaced open pits with average annual production of 316,000 ounces per year at projected total cash costs of US$224 per ounce.

The ongoing exploration program resulted in the discovery of the Cannu Zone - a new potentially high grade, near surface zone of gold mineralization located 350 m north of the proposed Portage open pit.

Some of the more significant regulatory accomplishments achieved by Cumberland in 2005 included the completion and submission of the Final Environmental Impact Statement to NIRB. Project permitting is in its final stages, and subject to NIRB approvals, plans are on track for production to commence in mid-2008.

GEOCHEMICAL CHARACTERISTICS AND THE ORIGINS OF DIAMONDS FROM THE SLAVE CRATON

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The geochemical characteristics of diamonds are studied to determine the composition, age and evolution of the mantle beneath cratons where diamonds form. This data provides important insights into mantle processes, and can directly be applied as a diamond exploration tool.

Mineral inclusion and carbon isotope compositions, and nitrogen contents and nitrogen aggregation states of diamonds from kimberlites in the Central and Southern Slave craton have been documented by Chinn et al., (1998), Davies et al. (2001), Tappert et al. (2003), Stachel et al. (2003), Davies et al. (2004) and Pohhilenko et al. (2004).

Like diamonds from other cratonic localities, diamonds from the Slave craton divide into eclogitic (E) and peridotititc (P) types, based on their included minerals. The E-diamonds have a broad range of C-isotope compositions ($\delta^{13}C$ = –35‰ to 0‰), while the P-diamonds have values that are largely within the mantle range ($\delta^{13}C$ = –9‰ to 0‰). Rare ultradeep (UD) diamonds from the transition zone and lower mantle have been identified at several localities.

The Central Slave diamonds divide into three groups based on their FTIR spectral properties: (1) Type II diamonds, and Type I diamonds with variable nitrogen contents and (2) very low (IaA: < ~10% IaB and no platelets) or (3) moderate to high nitrogen aggregation states (IaAB: > 10% IaB with platelets). These groups suggest unique source environments and/or timing of diamond growth. Type IaA diamonds indicate short (in the order of 10's of millions of years) or low-temperature (~1080˚C) mantle storage histories. The IaAB diamonds indicate longer or high-temperature mantle histories and/or stronger plastic deformation.

However, the groups defined by IR properties do not correspond to paragenetic groupings, nor are trends observed between the IR groups and the compositions of included minerals. Type IaA

diamonds however commonly have cubo-octahedral shapes. In addition, the range and distribution of C-isotope compositions for Type II, IaA and IaAB P and UD diamonds are similar and suggest a common carbon source. C-isotope compositions for Type II, IaA and IaAB E-diamonds are similar in their broad range of values with $\delta^{13}C$ peaks at –18‰, –15‰ and ~–9‰. However the IaA diamonds also show a broad peak between –4 and –6‰. E, P and UD-diamonds with different IR properties thus grew in the same mantle volume with variable temperatures. Alternatively they grew in the same environments over an extended period of time.

NRCAN'S RESEARCH PROGRAM RELATED TO THE MACKENZIE VALLEY PIPELINE

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Natural Resources Canada's Northern Energy Development (NED) program has two goals. First, it is designed to gather and disseminate scientific information that will help federal departments and other stakeholders carry out their environmental assessments of the Mackenzie Gas Project and of subsequent permitting and licensing applications. Second, the construction of the pipeline will stimulate new exploration and development; the program will gather information that will help in the assessment of new developments and will foster environmentally sound decisions in areas that could feed the pipeline, both on land and in the Beaufort Sea. The federal budgets of 2004 and 2005 provided the funds needed to carry out the work, which is mainly taking place in 2004 to 2006, although some of the projects run until early 2009.

NED consists of projects in geoscience, geomatics, and technology. The projects were chosen after an analysis of information gaps was completed in 2001 to 2003. New and revised topographic maps are begin compiled. Research is under way into landslides, slope stability, seismic risk, the effects of telluric currents on pipelines, coastal, marine, and nearshore geology, ecological land classification, and the reliability of pipe steels and welds. Surficial geological mapping is being updated from Great Bear River to Alberta. A new hydrocarbon resource assessment is under way for the west-central Mackenzie Valley. Posters or talks are being presented at the Forum on many of these projects.

UPDATE ON THE MACKENZIE GAS PROJECT AERIAL PHOTOGRAPHY AND MAPPING PROGRAM

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Indian & Northern Affairs Canada (INAC) and partners NWT Centre for Geomatics, Environment Canada, Municipal and Community Affairs and Natural Resources Canada have collaborated to provide current 1:30,000 scale colour aerial photography, supported by accurate updated DGPS ground control, new topographic maps with 1m contouring, a Digital Elevation Model (DEM), and a colour digital photo-mosaic of the Mackenzie Delta region and pipeline corridor to the Alberta- NWT border.

This project was part of the Program for Northern Oil and Gas Development approved by the federal government in the budget of February 2003. Ground control and aerial photographs were completed in late summer 2004, and aerial triangulation and scanning in February 2005. Production of digital topographic maps and Digital Elevation Models (DEMs) started in June 2005.

All digital data is available at minimal or no cost from the NWT Centre for Geomatics, GNWT Dept. of Industry Tourism & Investment or accessed on line via the Mackenzie Valley Air Photo Project website - http://nwtcrs.rwed-hq.gov.nt.ca/RemoteSensing/avhrr/MackenzieValleyPhotos.asp.
Data currently available includes a downloadable airphoto index in shape file format to permit users to identify airphotos by flight line, roll and photo number. Although the images have not yet been georeferenced, the negatives from the 4500 photographs have been scanned and are currently available in ECW format. In original TIFF format each photograph is approximately 800 Megabytes in size resulting in about 3.6 Terabytes of data. Due to size constraints, there are currently no plans to make TIFF images available via the internet. Instead, images have been converted to more manageable ECW format (225 GB). It is anticipated that ECW files will be available for download from the Mackenzie Valley Air Photo Project website by the fall of 2005. Copies of individual prints, or entire sets of photos, are available from the photography contractor.

In June, INAC issued the first in an anticipated series of mapping/DEM production contracts for production of 1m contour mapping and a DEM from the images. This work in the northern part of the delta region is scheduled for completion in late December 2005. As funding permits, RFP's for additional areas will be posted on MERX. This additional work may not be available for some time, perhaps as much as a year or even two, for the entire program area. Orthophotomosaics will follow, for individual areas as mapping is completed, or as a final product at the end of all mapping/DEM work.

PANDA KOALA AND FOX. CAN THESE ANIMALS BE CAGED? GEOTECHNICAL CONSIDERATIONS AND GROUND SUPPORT AT THE EKATI DIAMOND MINE™

Fortin, B.
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Geotechnical studies lead to the understanding of physical ground conditions, how they vary, and how they will affect mining and safety. These observations are based on traditional structure mapping, as well as an array of advanced electronic, and mechanical monitoring systems.

Since its official opening in 1998, the EKATI mine has grown both in its size, and complexity. Open pit mining is currently taking place it two pits, Fox and Beartooth, with four other pits having been initially mined out. Underground mining is ongoing beneath two of these mined out pits, Panda, and Koala, with a third ore body on care and maintenance. Each of these ore bodies is geotechnically unique, and understanding their nature is necessary for mine planning and ground support design.
The EKATI Geotechnical team is utilizing rapidly developing technologies, as well as time proven practices, to gain an understanding of the rock mass, and to predict how it will react to mining. This has been done through meticulous data collection, utilizing joint and fault mapping, Time Domain Reflectometry (TDR), extensometers, closure monitoring, ground movement monitors, and interpretation of ground movement and ground support strain. Each geotechnical domain is modeled separately to predict how it will react to mining, and to conventional ground support components.

The design of reliable ground monitoring and support systems are essential to mining performance and safety. The development of a Ground Support Plan at EKATI has proved especially challenging due to the unpredictable sub-surface conditions and the arctic environment. Through comprehensive geotechnical investigations and ground monitoring, a Ground Support Plan has been developed. The Ground Support Plan dictates what ground support system will be used for a given geotechnical domain. These systems include resined rock bolts, de-bonded rock bolts, split sets, screen, shotcrete, and thin spray on liners (TSLs).

This presentation will outline geotechnical studies currently taking place at the EKATI mine, and outline the ground support standards being utilized.

THE NEW ESS SECURE CANADIAN ENERGY SUPPLY PROGRAM - WITH EMPHASIS ON ITS NORTHERN CANADA ACTIVITIES

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In April 2004, the Earth Sciences Sector (ESS) of the Department of Natural Resources Canada announced the initiation of a new geoscience program with a five-year duration, the Secure Canadian Energy Supply (SCES) Program. This program was initiated in response to concerns over Canada's future supply of energy at a time when there are global worries of possible shortages and price increases. The role of this program will be to provide public-good geoscience information that will help increase the probability of finding new energy resources, reduce investment risk, inform resource management and environmental protection and contribute to energy policy formulation. The principal output of the SCES Program will be comprehensive basin resource assessments, that cover conventional and unconventional hydrocarbon resources, uranium, groundwater (as it relates to energy production) and include an examination of the geohazards and environmental considerations that could impact development.
Projects will be done in cooperation with the Provinces and Territories.

The program includes activities that are funded under the Northern Economic Development Initiative related to geoscience along the Mackenzie Valley pipeline route to assess hazards and environmental risks and to update resources assessments of the area impacted by the planned pipeline. Four new projects have been initiated in 2005. These will examine under-explored frontier areas in the east coast offshore, the hydrocarbon potential of the Gulf of St. Lawrence area and unconventional gas resources, especially coal-bed methane. The other new project is concerned with the hydrocarbon potential of the Arctic Islands. Its goal is to provide industry strategists and energy policy planners with the means of estimating the possible resource size and its probable location. It will also enable territorial governments, land use planners, land holders, Inuit groups, and communities to participate effectively in decisions that affect their interests by indicating where probable future production would occur so that planning for access, transportation routes, environmental impact and hazards can proceed in advance of the explorationists. It will achieve this by first assembling older data. This will be digitized, verified and loaded in to publicly-accessible databases through the GeoScience Data Repository. Data coverage will be accessed and new data acquired to fill in gaps. For example, preliminary analysis indicates that Lower Paleozoic strata of the Arctic Platform and Franklinian foldbelt is poorly represented in the geochemical data set, making it difficult to assess what petroleum systems might occur in this area.

In 2006, it is hoped that additional projects will commence including a nationwide assessment of uranium resources, ground water as it relates to energy production and activities examining shale gas and conceptual plays in Western Canada.

FRESH WATER INTRUSION AND BIODEGRADATION IN THE BEAUFORT-MACKENZIE BASIN

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From the over 200 wells drilled in the Beaufort Delta region over 2583 DST water analyses have been reported. Several culling techniques have been used to remove incomplete, poor quality, or suspect analyses. The resulting data set provides an excellent opportunity to examine the fluid history of the delta.

Formation waters in the delta have a broad range of salinity ranging from 2 to 45 g/l. The majority of samples are close to or below seawater salinity. There is no apparent relationship between salinity and depth. Principal component analyses divides the waters into three end member groups, with a forth group appearing to represent variable degrees of mixing between the other three. Group 1 waters closely resemble seawater whereas group 3 resembles a dilute fresh water. Fresh waters of group 3 are observed throughout the whole sedimentary column down to 4000 m. Spatially these waters are associated with coarse deltaic sediments in the Tugla and Richards sequences of Eocene age along the basin margin in the south, suggesting that there has been significant influx of fresh water into the delta sediments, driven by topographic force, prior to the deposition of Kugmallit sequence of Oligocene age.

Examination of major ion ratios indicates that freshwaters of group 3 show significant increase in the bicarbonate to calcium ratio. High bicarbonate levels suggest that the freshwater influx is associated with biodegradation of petroleum leading to CO_2 generation. Within siliciclastic sediments CO_2 generation would be buffered by silicate reactions leading to calcite precipitation, potentially reducing porosity and permeability.

SOIL AND LAKE SEDIMENT GEOCHEMISTRY IN EXPLORATION FOR DIAMONDS: NWT, CANADA

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[3] Richardson Consulting

Following the discovery of diamond bearing kimberlites in the Lac de Gras area, NWT, Canada, GGL Diamond Corp embarked in 1993 on an aggressive exploration program of indicator mineral sampling, geophysical surveys, prospecting, mapping and structural analysis. In addition, GGL extensively employed soil and lake sediment geochemistry based on an exploration model of erosion and dispersion of kimberlite in a glaciated landscape. Integrated with drift prospecting for diamond indicators, lake sediment and soil geochemistry allowed inexpensive, rapid assessment of prospective areas.

The Doyle Lake kimberlite sill underlies a thin to moderately thick blanket of till. Signature-element soil anomalies and indicator mineral anomalies abruptly terminated in a region of complex drift. Drilling discovered the sill to directly underlie these anomalies. Subsequent drilling demonstrated that the true limits of the Doyle Lake kimberlite intrusion and outlying bodies are best defined by soil geochemistry.

Recognizing that kimberlites will generally form a post-glaciation topographic low, GGL mounted a reconnaissance lake sediment program targeting areas with indicator mineral trains and/or geophysical anomalies. Geochemical orientation studies of sediment from known kimberlite-bearing lakes gave rise to a discrimination plot for kimberlite potential. Awry Lake was so defined as a highly-prospective target. Follow-up surveys uncovered anomalous indicator mineral counts and soil geochemistry immediately down-ice of the lake. Shoreline prospecting discovered carbonate-healed granite breccia boulders that yielded a G9 garnet. Drilling beneath the lake in early 2005 discovered extensive brecciation healed by carbonate. Processing of the core has yielded numerous indicator minerals including G9 and G10 garnets, some with selvages of kimberlite still attached.

OIL AND GAS IN THE NWT

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The presentation will cover the regulations involved in any oil & gas activity in the Northwest Territories, including a brief history of the activities over the past 10 years. It will also provide an overview of current and anticipated activities in the 3 disposition areas; Beaufort Delta, Central Mackenzie, Southern Mackenzie in addition to providing a brief overview of Devon's offshore drilling program in the Beaufort Sea.

NUNAVUT OUTREACH PROGRAMS - PARTNERS SHARING BEST PRACTICES AND OVERCOMING CHALLENGES

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Geoscience education and outreach activities in Nunavut are timely. Nunavut, formed April 1, 1999, encompassing 1/5 of Canada's landmass, has the smallest population (~29,000 people) of any Canadian jurisdiction. Nunavut's 28 communities are challenged by geography, climate and limited infrastructure. Internet access is finally reaching remote communities. Nunavut hosts

the four largest undeveloped gold resources in Canada. Kimberlite and diamond indicators are found every year and a diamond mine is under construction. 2005 mineral exploration expenditures top ~$191M. Mining represents one of the largest, long-term economic potential in the territory. However, mine participation by people of Nunavut has traditionally been low. Increasing geoscience appreciation and capabilities will enable Nunavummiut to utilize mining's potential.

Nunavut's partnership approach to public geoscience education involves territorial and federal governments, regional Inuit organizations, visiting scientists and mineral industry representatives. Geoscience is taught in Grades K-12, following Alberta and Northwest Territories curricula. Nunavut's Department of Education is developing a holistic curricula using traditional Inuit skills, values, beliefs and knowledge, as well as the Pan-Canadian Protocol.

Numerous partnership programs raise public awareness and knowledge in geoscience and technology; communication between outreach partners ensures program effectiveness. Such programs include the Kivalliq (central Nunavut) Science Educator's Community - educators, business, government and industry representatives. Initiatives include regional science fairs and Olympics, awards, and outdoor science-culture camps. The Nunavut Science Outreach Network connects science, technology and communities and brings together, via Internet and telephone, Canadian educators and scientists. Students at all levels are being exposed to career options in mining and geoscience.

Other programs include Nunavut Mining Week (recently held with increased public participation), Nunavut Mining Symposium (held annually in communities), introductory prospector courses, teacher workshops and Nunavut Tunngavik Incorporated (NTI) resource revenue fund programs. Two Nunavut high school teachers recently attended Carleton University's first, 2-week, successful Earth Sciences workshop. Two university students enrolled in geoscience at University of Western Ontario under a Government of Nunavut initiative will return to the communities as advisors. The Nunavut Geoscape poster, part of a Canada-wide Geoscape project by the Geological Survey of Canada, will raise awareness about significant geoscience issues in Nunavut's communities.

Despite local logistical challenges, geoscience outreach programs in Nunavut are successful. Prospectors are partnering with industry, communities are being consulted early in the mine production process, and are involved in resource development decision-making. Increased Nunavummiut participation encourages feelings of ownership and better scientific understanding.

EXPLORATION ACTIVITY IN THE SUMMIT CREEK DISCOVERY AREA, CENTRAL MACKENZIE VALLEY, NWT

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The Summit Creek area lies in the foothills of the Mackenzie Mountains 110 km south of the town of Norman Wells. Husky and the co-venturers hold the exploration rights for EL397, EL423 and adjacent freehold lands totaling 2400 square kilometres. Since 1999 the group has acquired 700 km of new 2-D seismic and drilled two exploration wells. The Summit Creek B-44 well spud on January 16, 2004 and was drilled to a depth of 3064 m in 63 days. Open hole testing confirmed the presence of hydrocarbons and the well was cased and suspended in late March 2004 with a completion and testing program planned for January to March 2005. Testing of the Summit Creek B-44 well in 2005confirmed a 180 m hydrocarbon column and two intervals flowed natural gas at a combined rate of 20 million cubic feet per day (mmscf/d) and more than 6000 barrels per day (bbl/d) of light volatile oil or condensate. One of the intervals also flowed approximately 1000 bbl/d of water. The Sah Cho L-71 well was spud January 21, 2005 to and was drilled to a depth of 3684 m in 43 days. The well evaluated a structural closure separate from Summit Creek B-44. Hydrocarbons were encountered at L-71 however open hole testing did not establish commercial flow rates and the well was cased and suspended.

The EL 397 co-venturers completed a 200 km heli-portable seismic program this past summer and intend to drill two wells this coming winter. One of the wells will assess the Summit Creek B-44 discovery and evaluate additional exploration plays on the structure. The second location is a wildcat exploration well that will test an undrilled structural closure. Logistics for operations in this remote and rugged area are particularly challenging. Access is winter only; equipment and materials from the south must either be barged up the Mackenzie River and staged until freeze up, or trucked up the Mackenzie Valley winter road from Wrigley. In November, staged construction equipment will begin building an ice bridge across the Mackenzie River and over 60 km of winter road to the lease. The exploration operations window is short, seventy days or less, with mobilization of equipment dependant on when the Mackenzie Valley winter road opens. All operations are preceded by extensive regulatory review and public consultation with the affected communities, land rights holders, and other stakeholders.

SNOWBALLS, "BUCKY" BALLS, AND SOME FUN GI.

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Contamination from exploration and industry is a major concern of Canadians, especially Northerners. Sound remediation projects and waste management plans are crucial for sustainable development within the NWT. Taiga Environmental Laboratory in conjunction with its partners and clients has played an active role in spearheading much of the scientific research

in this area. From bio-remediation to freezing to trapping of contaminants, old and new techniques are being used to maintain a balanced ecosystem. This presentation will address some of these techniques as well as some potentially new ways of dealing with waste management and mine reclamation.

LITHOLOGICAL MAPPING USING AIRBORNE HYPERSPECTRAL DATA

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Hyperspectral data offers great promise for lithological mapping in Canada's North because of increased spectral and spatial resolution. This allows for the identification of specific minerals and groups of minerals comprising certain rock groups (i.e. carbonates) as opposed to just simple discrimination common in lower resolution data such as LANDSAT and SPOT. Recently two airborne hyperspectral surveys have been flown over southern Baffin Island, a small survey in the Meta-Incognita peninsula and a much larger survey in the Kimmrut area. This presentation reviews different methods for producing a map showing spectral units that can be correlated to specific lithological groups (carbonates, granitoids, metasediments) using these datasets. Two different approaches are presented, the first is based on enhancement of the data followed by visual interpretation and the second involves a computer-assisted approach. The computer-assisted approach is divided into two methods. The first is an unsupervised method, which produces a spectral map automatically employing automatic end member identification algorithms and a K-means clustering technique. The second is a supervised approach, which involves the identification of training areas in which characteristic spectra for each lithology are collected and used to produce a spectral map through various classification algorithms (i.e. matched filtering, Spectral Angle Mapping). The data enhancement / visual interpretation approach is the simplest method allowing for input by the geologist in the spectral map-making process. Although subjective, this may provide the most comfort for geologists, as this is more akin to the traditional air photo interpretation approach, long used by geologists. The computer-assisted approaches are more objective, at least from a spectral basis, but rely on either automatic or user-assisted identification of spectral patterns (base on tonal response) and less on traditional elements of photo geologic interpretation, particularly pattern, texture and association. In this study the enhancement / visual interpretation and supervised approach produced better lithogical results than the unsupervised method.

PROSPECTING THE FUTURE: MEETING HUMAN RESOURCES CHALLENGES IN THE CANADIAN MINERALS AND METALS INDUSTRY

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Prospecting the Future: Meeting Human Resources Challenges in Canada's Minerals and Metals Sector is a comprehensive sector study of the short- and long-term human resource issues and challenges facing the minerals and metals industry. The study's in-depth assessment of current and emerging human resource needs and gaps, served as a foundation for the recommendations designed to maintain the strength of the minerals and metals sector well into the future.

Key Findings:

An aging workforce

- The age of the minerals and metals industry workforce is higher than that of the overall Canadian workforce.
- Over 50% of workers are aged 40 to 54, an age group that represents 39% of the total Canadian workforce.

Significant retirements on the horizon

- Employers predict that 24.5% of current workers will retire within 10 years, while 40% of employees surveyed in the research indicated they plan to retire within that time period.

Human Resources demand growth

- The retirement projections signal a looming human resources gap in the minerals and metals industry, but other factors indicate the gap will widen beyond retirees.
- More than simply replacing retired workers, the industry will need to expand its labour force to meet this demand-driven growth.

Supply challenge – Education and training programs

- Student enrollment in mining-related post-secondary programs is expected to be well below the predicted demand for highly skilled employees.
- There have been declining numbers of mining engineering graduates and a loss of some mining-specific programs in recent years.

Supply challenge – Non-traditional groups

- The minerals and metals sector has historically faced challenges recruiting women, who currently account for only 13% of all employees in the industry.
- Although the sector has had some success in recruiting Aboriginal employees, there are continuing challenges, including the fact that Aboriginal workers are under-represented in the more highly skilled positions.

Supply challenge – Other factors
The minerals and metals industry faces other challenges as it seeks to meet its human resources demands:

- competition from such industries as oil and gas, electricity utilities and construction;
- limited awareness and inaccurate perceptions about today's mining jobs; and
- concerns about working in commuter mining operations.

Supply advantage – Attractive features of mining

- Although wages are higher in oil and gas, mining employees earn more than their counterparts working in utilities, forestry, manufacturing and construction.
- Job security is also an attractive feature of jobs in the minerals and metals sector.

Supply and demand gap
Researchers analyzed the potential supply-and-demand gap for mining human resources under three scenarios: no-growth, low-growth and high-growth. For each scenario, the study predicted the number of jobs that would need to be filled, and the numbers that could be filled by traditional supply sources, principally post-secondary educated graduates.

- Under the no-growth scenario, the industry will still face a potential labour supply gap of 27,560 workers over the next 10 years.
- The potential supply gap with a low-growth scenario will be 47,350 workers.
- Under the high-growth scenario, the labour supply gap will be 70,810 workers over the next decade.

For more information on the study, or to download a copy of the report, please visit www.prospectingthefuture.ca.

PANDA, KOALA AND FOX. ARE THESE ANIMALS RELATED? COMPARISON OF ORE BODY GEOLOGY AT THE EKATI DIAMOND MINE™

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A comprehensive and well rounded understanding of ore body, and country rock geology is essential to safe, and efficient mining at the EKATI Diamond Mine. The geological model not only incorporates the traditional mineralogy and structural geology, but also includes studies in hydrogeology, permafrost, in-situ stress, and physical rock properties.

Since its official opening in 1998, the EKATI mine has grown both in its size, and complexity. Open pit mining is currently taking place it two pits, Fox and Beartooth, with four other pits having been initially mined out. Underground mining is ongoing beneath the mined out pits of Panda and Koala, with a third ore body on care and maintenance. Each of these ore bodies has

it's own unique geology, which must be understood in order to model ore grades and develop safe mining methods.

Exploration, Open Pit, and Underground Geologists have spent the past 15 years, collecting and analyzing geological information at EKATI. Initially, information was obtained exclusively from geophysics, surface mapping, and drilling. As mining progresses, much more information is being obtained, making it possible to evaluate pit push backs and underground mining. Such studies include in pit, and underground structural and petrology mapping, mineralogical analysis, bore hole and surface hydrogeology, bore hole thermistor installations, weathering tests, and the measurement of in-situ stress fields using strain gauges in bore holes.

Not surprisingly, though the Archean country rock is quite homogeneous, the Eocene kimberlite geology between different pipes, and within some of the individual pipes is quite variable. Panda, which was the first pipe to be mined, is dominated by steeply dipping volcanoclastics (bedded ashes) with varying amounts of olivine. Koala's geology is complex and variable, ranging from flat lying sediments (mudstones, siltstones and sandstones) near surface, down to bedded volcanoclastic, and finally, underlain by primary volcanoclastics (thick massive olivine rich layers). Fox is a totally different animal, being dominated by very massive tuffacious kimberlite (granite rich diatreme facies).

At the EKATI mine, VULCAN mining software is primarily used to store and analyze the geological database. This provides a format, which allows geological models to be passed on to other departments for their use in geotechnical monitoring and ground support design, mine design, and grade distribution analysis.

This presentation will compare the geology of three of the ore bodies currently being mined at Ekati.

DESIGN, CONSTRUCTION AND PERFORMANCE OF A BARRIER WALL WITH FROZEN FOUNDATION TO CONTROL HYDROCARBON SEEPAGE AT THE COLOMAC MINE SITE, NT.

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Hydrocarbon contaminated seepage had to be prevented before starting the excavation of a contaminated tank farm at the former Colomac Mine site in NT. The tank farm was located adjacent to a lake that is separated by a road fill and a narrow beach. The ground downslope of the tank farm consists of about 1.5m of sandy fill underlain by fractured bedrock. The active layer is up to 5m deep, possibly deeper. It was decided to construct a lined Barrier Wall that would be keyed into frozen rock.

The design principle for the Barrier Wall was to blast a 4m deep trench into the bedrock and super cool the base of the lined trench during early winter. A shallow active layer would be maintained during the summer of 2005 by means of an ice saturated coarse granular fill within the trench that would limit the depth of the active layer. This was accomplished by: a) blasting and excavating a 4m deep trench and lining it with a geomembrane in the fall of 2004; b) allowing the base and walls to cool to well below freezing temperature until early January 2005; c) filling the trench with cobble sized material in layers, saturating the fill and allowing the layers to freeze; and d) covering the ice saturated filled trench with insulation and 750mm surface road fill, respectively.

Ground temperatures at the base of the Barrier Wall and signs of any seepage at the beach downstream of the Barrier Wall were monitored continuously throughout the summer and into the fall of 2005. The monitoring showed the Barrier Wall was successful in preventing seepage. The warmest ground temperature at the base of the lined Barrier Wall during late summer was -0.5°C. This temperature was colder than ground temperatures that were measured in natural ground at similar depth.

IMPROVEMENTS IN EXPLORATION METHODOLOGIES AROUND THE DIAVIK DIAMOND MINE

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The Diavik exploration brownfields represents a maturing play with 13 years of continuous exploration completed. Within a 10km radius of the A154 Diavik kimberlite pipe, in excess of 1400 drillholes have been completed (all types), 1800 till surface samples collected and numerous ground and airborne geophysical surveys undertaken. This has resulted in a total of 67 kimberlites bodies being discovered throughout the Diavik claim block.

Most of the "bullseye" targets were drilled many years ago, and coupled with the typically very small size of the Lac de Gras pipes, ongoing discovery represents a challenge to traditional exploration methodologies. The Diavik project pipes represent kimberlites of the highest pedigree, and despite their relatively small size, contain tremendous value, and ongoing discovery remains a priority.

The 2005 exploration program saw the introduction of some new and innovative methodologies, particularly with respect to geophysical data collection. The Diavik exploration team collaborated with geophysicists from Aurora Geosciences to develop new mobile methods for undertaking ground magnetic and resistivity surveys towed behind a snowmobile. The snowmobile-ground magnetic system was designed to collect data in 3 components as well as total field; noise levels were consistent with those associated with a walk-mag survey, and

production was outstanding (typically 40 line km per day) relative to walkmag surveys. In addition, the Ohm-mapper resistivity mapping system was modified so that it could drag behind a snowmobile with differential GPS data collected in real-time. Trials conducted over known pipes confirmed the validity of this approach and production, although slower than for the snowmobile mag, was still a respectable 20 line km per day.

The new methodologies offer enormous improvements in productivity above that associated with grid based methods, at a quality consistent with walk-mag, and present the opportunity to collect data at a considerably higher resolution over much larger areas. A total of 2700 line km of snowmobile-mag data and 1350 line km of ohm-mapper data were collected in 2005.

For a relatively advanced exploration project these methodologies offer the advantages of a more complete picture and the thoroughness of a "fine tooth comb". In addition, numerous subtle, but previously unrecognised anomalies were identified and are being prioritised for follow-up. The successes achieved in 2005 offer lessons in the importance of collaboration, teamwork and innovation to ongoing success.

OVERPRESSURE DISTRIBUTION IN THE BEAUFORT-MACKENZIE BASIN FROM LOG, PRESSURE TEST AND DRILLING DATA

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The Beaufort-Mackenzie Basin of northern Canada is comprised of thick successions of rapidly-deposited, folded and faulted, Late Cretaceous to Cenozoic strata. These sediments are extensively overpressured and this has implications for understanding the hydrocarbon migration history and seal/trap integrity. Data from 250 exploration wells were assembled and used to map the depth to top of overpressure across the study area as part of a larger ongoing project examining petroleum systems of the region. Characteristic log signatures include an abrupt increase in sonic transit-time and abrupt decreases in bulk density and resistivity near the top of overpressure. Where possible, mud pressure profiles and point-wise pressure test data were used to confirm and refine interpretations based on multi-log analysis.

A depth contour map and cross sections through the basin illustrate how the depth to overpressure varies by more than 3 km across the study area. Overpressure is associated with thick Cenozoic successions in the offshore and Richards, Ellice and Langley islands areas, and it occurs in rocks of Paleocene (onshore) to Pliocene (offshore) age. This complicated pattern may represent a superposition of multiple generations of overpressure in association with rapid deposition and deformation of successive deltaic complexes. South, southeast and southwest of the Tarsiut-Amauligak Fault Zone, overpressure conforms to structural trends and shows an abrupt increase with depth: deep overpressures are associated with normal faulting whereas shallow overpressures occur on structural highs. In far offshore regions north of the Tarsiut-Amauligak Fault Zone, pore pressure shows a more gradual increase with depth and the top of

"hard" overpressure coincides with the base of the Plio-Pleistocene Iperk sequence. Although there is strong evidence for vertical fluid flow (migrated hydrocarbons, pressure charging, temperature anomalies, gas chimneys, diagenetic alteration), faults appear to act as horizontal barriers that compartmentalize the pressure distribution.

SOUTH WOPMAY BEDROCK MAPPING PROJECT AND INTEGRATED STUDIES: PRELIMINARY RESULTS FROM 2005, THE SECOND FIELD SEASON

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The South Wopmay bedrock-mapping project lies 225 km northwest of Yellowknife, between Indin Lake and the community of Gameti, NWT. The project is focused on the rocks within the southern part of the Proterozoic Wopmay Orogen. The north-trending Wopmay fault zone (WFZ) bisects the orogen, allowing subdivision of the project area into eastern and western domains. The eastern domain comprises mixed Archean and Proterozoic supracrustal and plutonic rocks, whereas the western domain, the Great Bear magmatic zone (GBMZ), has been interpreted as lacking Archean rocks. Currently, the project is supporting three B.Sc. theses, which are addressing key questions identified within the study area and beyond (see Brzozowski et al., Landry et al., and Moroskat et al., this volume).

East of WFZ, the Proterozoic Snare Group is composed of siltstone and mudstone, sandstone, carbonate (dolomite and limestone), and pebble conglomerate. Western exposures of the strata are dominated by gossanous argillites that are intercalated with mafic rocks. The metamorphic grade of the Snare Group rocks is mainly greenschist to lower amphibolite, however northwestern exposures of migmatite and gneiss indicate middle to upper amphibolite facies conditions. The Snare Group rocks rest unconformably on the highly strained, presumably Archean, two-mica Mattberry granite-granodiorite and associated migmatitic sedimentary rocks. Felsic to mafic plutons, interpreted to be Proterozoic, are distinguished by the presence of hornblende. In eastern parts of this domain, the main structural grain is NNE and Snare Group rocks are folded about shallow NNE- and SSW-plunging axes. Locally, towards WFZ, the rocks are structurally more complex; steep inclinations of bedding and cleavage in the Snare Group rocks contrast with shallowly dipping panels of older granitic and migmatitic metasedimentary rocks. Laterally extensive gossanous zones within western exposures of the Snare Group contain stratabound pyrrhotite ± chalcopyrite with overprinting pyrite and chalcopyrite mineralization. These new and previously recognized zones are interpreted as volcanic-hosted or exhalative styles of mineralization. To test the potential of this mineralization, approximately 40 assay samples were collected.

The western domain is dominated by plutonic phases of the GBMZ that are similar in composition to those east of WFZ, except that they are commonly magnetite bearing and lack muscovite. Rhyolitic to dacitic porphyries, interpreted as high-level intrusions, are abundant and locally associated with volcanic rocks (Faber Group?). Sedimentary rocks similar to the Treasure Lake Group are exposed mainly at DeVries Lake, although mapping in 2005 has reinterpreted the Treasure Lake Group quartz arenite at DeVries Lake as altered quartz porphyry. Widespread alteration of some magmatic phases and the Treasure Lake Group sedimentary rocks is recognized in the DeVries Lake area. The observed sodic, potassic, magnetite, amphibole, epidote, and silica alteration is similar to alteration types documented in iron-oxide-copper-gold (IOCG) deposits. Southwest of DeVries Lake, a newly found copper showing consists of quartz-vein-hosted chalcopyrite within a dioritic intrusion.

NEW URANIUM-IN-CANADA PROJECT: PROSPECTS AND PROCESS

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With increased pressure on international energy supplies, the Geological Survey of Canada has instituted a new program entitled "Secure Canadian Energy Supply". As part of this program, a project entitled "Uranium in Canada" is being developed through stakeholder consultations, with anticipated start-up in April 2006. Part of the planning process involves a review of uranium knowledge and potential in Canada. Completion of the "EXTECH IV Athabasca Uranium Multidisciplinary Study", and publication of its final results in a volume on the Athabasca Basin have provided an example for future studies that would involve comprehensive basin analysis as a basis for resource assessment. Guidance, sharing and preservation of expert knowledge from the exploration community, as part of the application of current geological, geophysical and geochemical methods through federal-provincial-academic partnerships, generated huge advances in geological knowledge, re-established some expert capacity in provincial and federal surveys and academia, and provided a better understanding of uranium potential and exploration technology in the Athabasca Basin. This took 4 years, $7 million and a team of 80 geoscientists. One key result has been to clarify the areas of highest potential for further study.

Aside from the above project in the Athabasca Basin, and some ongoing Canadian and international research at Queens University by K. Kyser and others, very little public domain uranium geoscience has been done in the rest of Canada since the early 1990s. The Uranium Resource Assessment Group at the GSC operated as a team of geoscientists from the 1950s for 4 decades, in order to maintain knowledge of uranium potential at an adequate level to inform government policy. Any national synopsis based on archival information will date from those early years, and will provide only a cursory indication of the geological environments in Canada where uranium exploration is now once again very active. Through renewed federal-provincial-industry-academic partnerships it will be possible to rejuvenate Canada's uranium expertise to a level that is adequate to once again inform public policy and provide useful guidance to grass-roots through advanced exploration. It is important to focus field efforts on areas with a

reasonable chance of contributing significant economic resources of uranium to Canada's inventory.

Global context is important for those engaged in production, exploration and communication in the well endowed Canadian nuclear energy industry. Social-political context strongly affects the viability of uranium deposits around the world (Canadian Nuclear Association, www.cna.ca; Uranium Info Centre Ltd., www.uic.com.au). Canada is favoured by its stable and transparent land management practices that have contributed to its position as producing 1/3 of the world's primary uranium. Maintenance of this position requires discovery and development of new resources.

World U resources are contained in some fourteen different types of deposit. The major types, in decreasing order of resources, are as follows:
Mesoproterozoic unconformity-associated (>33% mainly in Australia and Canada), the lone Olympic Dam Mesoproterozoic breccia complex deposit in Australia (>31%), sandstone hosted (>18%, mostly in Kazakhstan, Niger and USA), surficial deposits (4% mainly in Australia) and large tonnage but low grade resources in early Paleoproterozoic conglomeratic (e.g. Blind River in Canada) and volcanic (e.g. Streltskova in Russia) deposits. Metasomatic, metamorphic, granite-hosted and vein-type deposits are minor. Unconformity-associated uranium is the premier deposit type in Canada and the world, in terms of size and grade of individual deposits. The most spectacular grades and tonnages are those of the Cigar Lake deposit (E and W zones combined = ~15 % U, containing 131,400 tonnes U and the McArthur River deposit (~23 % U, containing ~190,000 tonnes U) in the Athabasca Basin. Known deposits in Thelon Basin suggest similar potential there, and geological similarities are encouraging in the Hornby Bay, Elu and Otish basins. Huge, low-grade but economically valuable, sandstone-hosted deposits are attracting intensive exploration around the world, with Kazakhstan exemplifying the upswing of development using in-situ leach technology. Similar settings in southern New Brunswick, Labrador, Saskatchewan, Alberta and Northwest Territories require increased geological knowledge and comparative analysis in order to better understand their resource potential.

UNCONFORMITY ASSOCIATED URANIUM DEPOSITS

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This paper focuses on EXTECH IV results from Athabasca basin, hosting the world's largest known high-grade U resources, especially in the east along the basement Wollaston-Mudjatik

transition domain where Cigar Lake and McArthur River deposits contain 131,400 and 177,570 tonnes U at 15% and 20% grades respectively. Elsewhere in the basin, high grades have been mined and excellent prospects are being explored.

Veins and disseminations of uraninite are spatially associated with unconformities between relatively flat-lying, apparently un-metamorphosed but pervasively altered, late Paleoproterozoic to Mesoproterozoic, siliciclastic, mainly fluvial, red-bed strata and intensely paleo-weathered, highly metamorphosed fold-thrust belts of interleaved Archean to Paleoproterozoic granitoid and supracrustal rocks including metapelite. U dominates in monometallic (generally basement-hosted) deposits; and is the principle commodity in polymetallic (commonly at the unconformity) deposits with variable amounts of Ni + Co + As, traces of Au, Pt, Cu etc. Athabasca Group strata record subtle reactivation of basement faults and uplifts ~1750-1500 Ma. Paragenesis of ore, associated chlorite, quartz, dickite and dravite, and post-ore carbonaceous material records diagenetic and hydrothermal activity, and fault reactivation in sulfidic graphitic meta-pelite, at ~1500, 1300 and 1100 Ma. Hydrothermal systems, sub-horizontal in the Athabasca Group and vertical in intersecting subsidiary faults, formed roll-front-like basement-hosted ingress deposits, and lens- to cigar-shaped polymetallic egress deposits at and just above the unconformity. Individual uraninite pods and lenses, like precious metal vein deposits, fill spaces in tension and Riedel shears that reflect overall deposit geometries. Condensed alteration fronts of ingress deposits are small exploration targets. Alteration envelopes of egress deposits are variably de-silicified + illitic (e.g. Cigar Lake), +/- outer silicified (Q2) / kaolinitic / dravitic zones (e.g. McArthur River). In the east, the conglomeratic Manitou Falls Formation was derived from U-Th-K-rich granitoid basement terranes but is regionally depleted in U and K. We propose that residual less-mobile Th testifies to scavenging of U and K to form ore and illite halos respectively, much as PGE depletion in mafic magmatic suites predicts ore.

Multiple geophysical methods are important for exploration. Infrared spectrometry distinguishes clay and other alteration minerals in the field. Airborne and bore-hole gamma-ray spectrometry measure U, K and Th. Seismic reflection maps the basement unconformity and structures in basement and Athabasca Group. Magnetic, electromagnetic and audiomagnetotelluric methods map basement rock units, detect alteration zones of higher (silicified) or lower (desilicified) resistivity within strata, and delineate sulfidic-graphitic shear zones. Gravity contributes to integrated analysis with geology and geochemistry.

SNOW COVER AND SUBNIVEAN AND SOIL TEMPERATURES AT ABANDONED DRILLING MUD-SUMPS, MACKENZIE DELTA, NORTHWEST TERRITORIES, CANADA

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In permafrost terrain, drilling-mud sumps excavated in frozen ground are designed to contain wastes generated by exploratory oil and gas drilling. When drilling operations are complete, the sump is backfilled with excavated materials. Over time, the active layer should re-establish and be maintained in the sump cap, with the deposited contaminants remaining in underlying frozen ground. In this paper, the influence of snow cover on subnivean and permafrost temperatures is investigated at several sumps in alluvial terrain of the outer Mackenzie Delta. The four sumps studied were abandoned in the 1970s. Two sumps have re-vegetated with tall shrubs and two have caps re-vegetated with only low-lying grasses. In March 2005, mean snow cover on the bare sump caps were 56 and 67 cm, with deeper snow drifts around sump perimeters (64 and 103 cm). Adjacent undisturbed terrain had mean snow depths of 31 and 39 cm, respectively. Snow cover on sump caps re-vegetated with tall shrubs was greater than 120 cm. Mean snow depths around the perimeter of the sumps ranged from 88 to 98 cm, but means of 46 and 67 cm were observed in surrounding, undisturbed alluvial terrain. A positive, curvilinear relation was observed between snow depth and subnivean temperatures. Variations in near-surface permafrost temperatures across a sump cap were associated with patterns of snow accumulation. Sites with low snow accumulation, such as sump caps with low-lying grasses and undisturbed terrain with sedge vegetation, were characterized by cold mean temperature at the top of permafrost (MTTop)(> -5 °C). In contrast, areas with high snow accumulation, including sump caps with tall shrubs and sump perimeters, were characterized by MTTop that ranged from -0.5° to -1.0 °C and active-layer depths that exceeded 130 cm. Warming of permafrost as a result of perennial snow accumulation might lead to the long-term thawing of waste within the sump and may promote lateral migration of contaminants. If ice-rich permafrost is degraded, thaw settlement can lead to collapse of the sump cap. The field data demonstrate that in permafrost terrain, sump abandonment practices should consider contouring and reclamation plans that inhibit snow accumulation.

MINE RECLAMATION AND FINANCIAL ASSURANCE LEGISLATION – NORTHWEST TERRITORIES AND PROVINCIAL COMPARISON

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The Government of Canada through the Minister of Indian and Northern Affairs Canada owns, administers, and manages federal crown lands, water resources, and water rights in the

Northwest Territories. The Minister's power and authorities are derived from the Territorial Lands Act, Mackenzie Valley Resource Management Act, and the Northwest Territories Waters Act. The MVRMA and NWTWA enable the establishment of Land and Water Boards. The Boards are authorized to issue Class A and B Land Use Permits and Type B Water Licences. The Minister upon the Board's recommendations issues Type A and Type B Water Licences that were subject to public hearings. The Boards may require proponents to submit financial assurance under the terms and conditions of their approved Land Use Permits and Water Licences.

On July 29, 2002, the Minister released the Mine Site Reclamation Policy for the Northwest Territories and Nunavut - A policy for the protection of the environment and the disposition of liability relating to mine closures in the Northwest Territories. The policy addressed four main objectives: 1) Ensure the impact of mining on the environment and human and safety is minimized, 2) Reduce the environmental liability that falls to government to the greatest extent possible, 3) Provide industry and public with a clear signal of the government's expectations, and 4) Build positive and supportive relationships with the new regulatory authorities coming into operation in the North.

To follow the Minister's Policy release, the author undertook a thorough and comprehensive review of the Northwest Territories regulatory environment and compared all the provincial governments and departments that have advanced mineral exploration and mine development mandates. This presentation summarizes the author's June 2005 discussion paper that compares the financial assurance types and amounts that are prescribed in provincial legislative frameworks, policies, and guidelines. The paper highlights provincial legislation, resource management, and financial assurance similarities and differences, public and stakeholder consultation, reclamation cost estimate tools, and information management sources. The presentation concludes with a summary of common themes within provincial governments, legislative frameworks, and mine reclamation and financial assurance requirements.

THE APPLICATION OF GEOSCIENCE IN THE CONSERVATION PLANNING PROCESS

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The Northwest Territories Protected Areas Strategy (NWT-PAS) outlines a series of eight steps for the planning and establishment of protected areas, one of which (Step 5) calls for a detailed evaluation of the area's ecological, cultural and economic values.

The evaluation of the values includes the assessment of the social and economic effects that establishing a protected area might have upon the proposed area as well as the local and nearby

communities. This presentation will briefly review the PAS process and describe how the detailed Non-Renewable Resource Assessment will be integrated with the Renewable, Ecological, and Cultural Assessments to produce the Socio-Economic Assessment for Candidate Protected Areas. The Edehzhie Candidate Protected Area process will be presented as a case study.

2005 UPDATE FROM HACKETT RIVER, NUNAVUT: AN EMERGING SILVER DEPOSIT?

Klatt, H., Drost, A., and Burgess, S.
Sabina Silver Corporation, Thunder Bay, Ontario

SABINA SILVER CORPORATION is a Canadian public mineral exploration and development company with assets in the Stewart-Eskay Creek Mining District, the Red Lake gold camp and at the Hackett River silver-zinc property in the Canadian Arctic.

An updated mineral resource estimate on Sabina's 100%-owned Hackett River deposit has been released (August 15-05)**.** At a zinc-equivalent cutoff grade of 3%, the Boot Lake, East Cleaver and Main Zones contain a combined resource of 51.6 million tonnes. This includes an Indicated Mineral Resource of 37 million tonnes with an average of 4.66% zinc, 3.79 ounces per ton silver, 0.63% lead, 0.34% copper and 0.011 ounces per ton gold. The Inferred Mineral Resource totals 14.6 million tonnes with an average grade of 3.62% zinc, 3.61 ounces per ton silver, 0.51% lead, 0.28% copper and 0.007 ounces per ton gold (Wardrop Engineering Inc., 2005).

The Wardrop analysis demonstrates a substantial Indicated metal content at Hackett River of greater than 150 million ounces of silver and greater than 1.7 million tonnes of contained zinc. If one considers net silver-equivalent grades by normalizing zinc, copper, lead and gold into the silver through the application of historical cutoff grades and conservative metal pricing factors, Hackett River contains an indicated silver-equivalent resource in excess of 650 million ounces.

The Hackett River Belt has the potential to become a unique new silver-rich VMS camp in Canada. The known deposit area is one of the largest undeveloped silver and zinc-rich resources of its kind in Canada. Wardrop Engineering will also provide Sabina Silver Corporation with advice on proceeding to production pre-feasibility. There are two other as-yet-underexplored resource areas on the Property and the future exploration potential for additional base metal and precious metal resources on the Hackett River Property is considered high.

SPATIAL AND TEMPORAL VARIABILITY IN WATER QUALITY OF SMALL TUNDRA LAKES AND STREAMS ALONG THE PROPOSED MACKENZIE GAS PIPELINE, MACKENZIE DELTA REGION, NORTHWEST TERRITORIES, CANADA.

Kokelj, S.V., Jenkins, R. and Milburn, D.
Water Resources Division, Indian and Northern Affairs Canada, Yellowknife, NT

Understanding naturally occurring variation in lake water quality along the proposed Mackenzie Gas Pipeline (MGP) is required for sound environmental management and effective monitoring of this development. There are approximately 6000 lakes and ponds situated on tundra uplands within 12 km of the proposed pipeline route between Inuvik and the Beaufort Sea coast. The median lake area is approximately 2 ha, thus much of the aquatic habitat in this region is in association with small lakes. Here we present water quality characteristics of sixty small tundra upland lakes along the proposed MGP. Thirty of the lakes are pristine and thirty have catchments affected by thermokarst slumping. The research objectives are: 1) To determine natural spatial and temporal variability in the water quality of small tundra lakes, and 2) to determine the effect of permafrost degradation on the water quality of the tundra lakes.

The catchment areas ranged from 5 to 250 ha and lake areas ranged from 1 to 115 ha. The mean dissolved organic carbon (DOC) concentration of the pristine lakes (16.5) was greater than the mean concentration of lakes disturbed by thermokarst slumping (14.5). In pristine lakes, mean concentrations of Ca, Mg and SO_4 were 10.5, 3.9 and 8.3 mg/l, but in lakes affected by thermokarst, mean concentrations were 56.3, 19.2 and 125.0 mg/l, respectively. Soluble materials released from degrading permafrost are transported to lakes by surface runoff, elevating concentrations in lake water. In disturbed lakes, ionic concentrations were related to the percentage catchment area disturbed, and the relative age of disturbance. Slumps occupying as little as 2% of catchment area may modify the chemistry of lake water, and the water quality may remain affected for several decades after thermokarst has ceased. In pristine lakes, late summer major ion concentrations from 2003 to 2005 varied by less than a few mg/l, but in lakes affected by active slumping, ionic concentrations increased by up to 20 mg/l per year.

In summary, water quality of undisturbed tundra lakes was characterized by low ion concentrations and low inter-annual variability. Our data shows that slumping can rapidly modify the water quality of small tundra lakes as indicated by higher ionic concentrations and pH levels, and lower DOC concentrations in disturbed lake water than in pristine lake water. Currently about 5%, or 300 of the lake catchments in our study area are influenced by thermokarst slumping. Climate warming may increase the frequency and magnitude of thermokarst, and thus the number of lakes in the region that are influenced by slumping.

The data show that the water quality of small tundra lakes is very sensitive to terrain disturbance. The impact of potential anthropogenic disturbance or contamination will be first detected in small systems. Small tundra lakes are numerous along the pipeline corridor and are often situated at the headwaters of larger catchments therefore, it would be prudent to examine contaminant transfer through these systems prior to major development in this region.

DIGITAL DATA CONVERSION OF BEDROCK GEOLOGY MAPS

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Sunram Systems Inc. Mississauga, ON

Bedrock geology forms the basis for geological evaluation for minerals, oil and gas. Digitised maps facilitate integration, presentation, distribution and analysis of geological information. Beneficiaries include investors, communities, governments, the mining and petroleum industry. We present an integrated approach of GIS and geological interpretation to digitizing or vectorizing bedrock maps. Our vast experience extends to mapping projects across Northern Canada & Arctic regions e.g. Slave Craton, Melville, Okulitch, Okanagan, Selwyn, Mackenzie Valley. These maps now residing in GIS based platforms form part of the compilation.

The interpretation of geological information from "worn out, black and white folded maps" poses serious challenges and adds the "fun" component to these projects. To overcome these challenges, the program is managed by a team of geologists, software engineers, GIS & QC personnel.

A detailed methodology is in place for the digitizing program starting from the original raster images to the delivery of the final vector output. Initially a rule-based program is defined and staff trained accordingly. The process focuses on point symbology, symbol orientation, digitization and direction of specific line types. Customized proprietary production tools are developed to maintain accuracy and facilitate a high level of process automation. User interface with the production team at critical phases of the project is essential for the success of the program. The input review covers the resolution of the scanned maps, their projection parameters and specific client requirements. Several steps are taken prior to the conversion to check data accuracy. Data is then cleaned following specific routines, geological boundaries vectorized in layers and converted to polygons, topology is created and data attribution is linked through a common field in graphical entities and database to every feature using Arc GIS. Capture of hydrographic information is usually not required. After Quality Assurance data is translated to ESRI ArcGIS 8.x shape files. Other supporting formats for vector output include e00, dwg, dxf etc.

Certain challenges arise when dealing with structural lines (folds, faults) and points (foliation, bedding) and polygons (litho units). Similar issues come up relating to map resolution, projection parameters, database creation, specification inconsistency etc. These will be discussed in further detail.

SUMMARY OF ROCK-EVAL DATA FOR THE WHITEHORSE TROUGH, YUKON: IMPLICATIONS REGARDING THE HYDROCARBON POTENTIAL OF A FRONTIER BASIN

Lowey, G.W.
Yukon Geological Survey, Whitehorse, YT

Whitehorse Trough is a frontier basin in south-central Yukon that is thought to contain gas and possibly oil. It formed in the early Triassic as an arc-marginal basin between the ancient North American margin to the east and the volcano-plutonic Stikine Terrane to the west. Three stratigraphic units, termed the Lewes River Group, the Laberge Group and the Tantalus Formation, are recognized in the Whitehorse Trough. The Lewes River Group (Upper Triassic) is informally subdivided into the lowermost Povoas formation, consisting of basalt, tuff and agglomerate, and interpreted as subaqueous lava flows, and the uppermost Askala formation, consisting of sandstone, shale, conglomerate and limestone, and interpreted as deep-marine, reef, beach and tidal flat deposits. The Laberge Group (Lower-Middle Jurassic) is informally subdivided into four units, which from the base upwards, includes the Richthofen (i.e., thin to medium bedded sandstone-mudstone couplets), Conglomerate (i.e., framework supported conglomerate), Nordenskiold (i.e., dacite tuff) and Tanglefoot (i.e., coal-bearing sandstone, shale and conglomerate) formations, which are interpreted as submarine fan, fan delta, subaqueous pyroclastic and delta deposits, respectively. The Tantalus Formation (Upper Jurassic-Lower Cretaceous) consists of fluvial and paralic sandstone, conglomerate and coal. Over 600 samples from these units have been analyzed by programmed pyrolysis and combustion. The data, together with coal rank, vitrinite reflectance, and the color of microfossils (i.e., conodonts, spores and pollen), indicates that the Povoas formation has no source rock potential; the Aksala formation is a poor source rock, probably gas-prone and postmature; the Richthofen formation is a poor to fair source rock, gas-prone and postmature; the Conglomerate and Nordenskiold formatioins have no source rock potential; and the Tanglefoot and Tantalus formations are good to very good source rocks, mainly gas-prone with a possibility of oil and immature to early mature (i.e., several samples are at the top of the oil window). Hence, the Aksala and Richthofen formations are interpreted as 'spent' source rocks, whereas the Tanglefoot and Tantalus formations are interpreted as 'potential' source rocks and possibly 'effective' source rocks for the Whitehorse Trough.

REFLECTION SEISMIC MAPPING OF THE CENTRAL MACKENZIE VALLEY AND GREAT BEAR PLAIN - SOME NEW INSIGHTS

MacLean, B.C.
Geological Survey of Canada, Calgary, AB

A regional structural and stratigraphic interpretation of the subsurface under the mainland NWT, using exploration well and reflection seismic data carefully tied to surface mapping, has been

undertaken at GSC-Calgary. This work is in support of the NWT Atlas Project and petroleum assessments related to pipeline development.

Preliminary maps and cross-section have been prepared across an area extending from the Mackenzie Mountains eastward to Blackwater Lake and from Fish Lake northward to the 66th parallel (excluding Norman Wells). The area includes such major geological features as the Franklin Mountains, Mahony Arch, Keele Arch, Mackenzie Trough and portions of Great Bear and Root basins.

Principle relationships revealed include a NNE trending fracture set whose influence persisted into the Cretaceous and a clearly outlined Mackenzie Trough with its companion Mahony Arch. Basement is deepest within rhomb-shaped areas located east of MacKay Range and this pattern was re-established during the Cretacous. Local thicks and thins of Cambrian strata are products of salt flow.

The complicated tectonic history of Keele Arch remains unresolved but seismic sections show the area to have undergone periods of major uplift and subsidence. Possibly the greatest uplift occurred in the southwest where pre-Devonian erosion truncated Cambrian strata of Mackenzie Trough to the extent that Devonian strata directly overlie Proterozoic basement. Here the arch defines the eastern flank of Root Basin.

Great Bear Basin is relatively shallow and undeformed except for the large amplitude Blackwater Lake Fault where salt flow is interpreted to have produced shallow anticlines above the trace of the normal fault.

Work continues with mapping of additional horizons.

REMOTE PREDICTIVE MAPPING AND REGIONAL BEDROCK MAPPING TEAM UP: A NEW APPROACH

Martel, E.
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The main objective of Remote Predictive Mapping (RPM), as promoted by the RPM- Northern Development Program (Geological Survey of Canada), is to allow scientists to map more efficiently in the field. RPM techniques were applied to the Snowbird Lake Mapping Project, a multidisciplinary study initiated by the Northwest Territories Geoscience Office (NTGO), and followed up by 10 weeks of field-mapping (ground truthing). The technique improved the efficiency of field mapping and enhanced the final product.

The Snowbird Lake Mapping Project (NTS 65D) was a one-year multidisciplinary study covering an extensive area (~100 km^2) with very few bedrock exposures. The project

components include RPM, bedrock and surficial mapping, geochronological, geochemical and integrated mineral occurrence studies, as well as a drift prospecting survey.
Advances in the acquisition, processing, and dissemination of remotely-sensed data have enabled the rapid compilation of images and datasets such as geophysical data, digital elevation models, hydrology and topography, gravity data, radiometric data, satellite imagery (Landsat and Radarsat) and aerial photographs. All available geological maps of the study area and surroundings (1:5 000 to 1:250 000 scale) were scanned and georeferenced. All data were compiled into a GIS database.

Geological observations and data (lithological description, sample location and description, geochronological and geochemical data, and showings data) from existing studies were extracted from their interpretative context and combined with the other data sources to reinterpret the geology of the study area. A common legend was built combining all available lithological descriptions. The aeromagnetic data obtained from a survey flown at 400-meter spacing over the study area, combined with the existing geological data, was very useful in re-interpreting geology and producing the predictive map.

The resulting predictive map was valuable for defining major lithological and structural domains, targeting problematic areas and, to some extent, for predicting the area's economic potential. The digital elevation model, combined with an aerial photograph mosaic and satellite images, was beneficial in identifying areas of low versus high outcrop potential. RPM techniques were successfully applied to the Snowbird Lake Mapping Project; field-mapping was targeted and strategic, which allowed an extended coverage and maximized mapping impacts.

FTIR SPECTROSCOPY OF KIMBERLITIC OLIVINE: A NEW TOOL IN DIAMOND EXPLORATION

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Unaltered forsteritic olivine is frequently discovered in till samples collected during diamond exploration in the Canadian Arctic. Owing to its high modal abundance in kimberlite, olivine could be a perfect Diamond Indicator Mineral (DIM). However, forsteritic olivine in till derives not only from kimberlite but may also have peridotitic or basaltic sources. Neither the forsterite content nor the trace element composition of olivine can be used to unambiguously identify a primary kimberlitic association and thus in the past olivine could not be regarded as a reliable DIM. In this study we explore the possibility of using FTIR (Fourier Transform Infra-Red) spectroscopic measurements of hydroxyl (OH^-) in the olivine crystal structure to distinguish between kimberlitic and non-kimberlitic sources.

FTIR measurements show that olivine macrocrysts from Canadian kimberlites contain very high concentrations of hydroxyl (further referred to as concentration of "water"). This is consistent with previous studies of olivines from South African and Siberian kimberlites. The majority of

the studied olivines contain between 50 and 250 wt. ppm of water (weighed average is 180 wt. ppm), which is significantly higher than concentrations reported for olivines crystallizing at shallow depth from hydrous magmas (e.g. olivine phenocrysts from Cyprus boninites contain 15 - 25 ppm H_2O) or at great depth, but low water fugacities (olivine from mantle peridotites commonly contains water at or below the detection limit of FTIR spectrometers). Thus olivine with >50 ppm of water is likely to originate from kimberlites.

A good correlation between grain thicknesses and the area of IR absorption peaks measured in the wavenumber range between 1650 and 2150 cm^{-1} (second order Si-O overtone) allows quantitative measurements of H_2O concentrations on unpolished olivine grains less than 0.5 mm in diameter.

Different positions of OH absorption bands in the FTIR spectrum of olivine can be used to speculate on conditions of olivine crystallization and kimberlite evolution. A comparison of FTIR spectra measured on kimberlitic olivines with previously reported spectra of olivines hydrated in high pressure experiment allows to isolate 2 groups of olivines: (1) olivines crystallized or equilibrated with hydrous melt/fluid at pressures ≥2GPa and (2) olivines crystallized or equilibrated with a hydrous fluid at pressures below 2GPa.

INCLUDING ABORIGINAL PEOPLES AND TRADITIONAL KNOWLEDGE IN THE REMEDIATION CONTAMINATED SITES

Mills, C.
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The Department of Indian Affairs and Northern Development has included Aboriginal Peoples in the development of remediation plans for abandoned mines and remediation activities since the early 1990s. The NWT Contaminants and Remediation Directorate has developed a consultative process that enhances the capacity of local communities to participate meaningfully in decision-making processes and that facilitates the inclusion of traditional knowledge in remediation plans. An example of a decision matrix and option selection process will be highlighted. Through this process, better and sometimes less expensive, remediation options have been developed, that are acceptable to both Federal and Aboriginal governments.

This presentation will provide an overview of the successful initiatives developed by DIAND for including Aboriginal Peoples and TK in the remediation of contaminated sites in the NWT. Ideas on how to involve Aboriginal peoples and traditional knowledge in your projects and planning will be provided.

COMMITTEE BAY PROJECT: RESULTS OF 1:25 000 GEOLOGICAL MAPPING

Mills, A.[1], Martel, E.[1], and Duke, N.[2]
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The Committee Bay greenstone belt is located in the Rae domain of the Western Churchill Province. The belt is a laterally extensive, 300 km long, northeast-trending supracrustal belt that extends from the Amer Fault zone to the western shore of Committee Bay. The southernmost part of the belt (NTS 56K) is centered on a ~30 km wide by 35 km long variably foliated and poorly exposed tonalite pluton, referred to as the Central Tonalite (CT). During the 2005 field season, two major areas, east and southwest of the CT, were mapped at 1:25 000 in order to improve on previous 1:100 000 mapping and to provide a regional context for mineral prospects in these areas. The dominant supracrustal rocks differ between the two map areas: ultramafic and mafic volcanic rocks and lesser intermediate to felsic volcaniclastic rocks of the lower Prince Albert group (PAg) dominate the map area east of the CT whereas siliciclastic and intermediate volcanic rocks of the middle PAg sequence predominate the study area southwest of the CT. The style of deformation is also distinct in each of the two areas. Strain partitioning dominates the structural story in the east where the map pattern is controlled by attenuated northeast-trending D_2 folds and high strain zones. In the west, northwest-trending D_1 fabrics (foliation and map-scale folds) are well-preserved and are overprinted by F_2 folds which progressively tighten towards the west. This geometry is consistent with the suggestion that the CT acted as a rigid body during deformation, with "pressure shadows" effectively forming adjacent to the CT and in the plane of maximum compression. The age of D_1 deformation remains contentious but recent evidence from porphyroblast - fabric relations and SHRIMP dating links ca. 2.35 Ga metamorphism to regional D_1 deformation. Evidence of D_1 folding and imbrication of Proterozoic quartz arenite (<2496 Ma; U-Pb on detrital zircon) along with adjacent Archean rocks observed during this study is consistent with D_1 deformation at ca. 2.35 Ga. The dominant N- to NW-directed transpressional D_2 event is well documented at ca. 1.85-1.815 Ga. Late-stage, brittle-ductile, NW-directed D_3 shortening is manifest as a late, shallow crenulation and likely produced the N-S-trending Brown River Deformation Zone. Gold exploration targets include iron-formation-hosted gold and shear-hosted gold in high strain zones at lithological contacts.

ARCTIC NICKEL – NORTHERN VICTORIA ISLAND REVISITED

Morgan, D.
Great Northern Mining and Exploration, Toronto, ON

This talk seeks to introduce Great Northern Mining and Exploration's "Umingmak" nickel-copper-PGM exploration project on Victoria Island, north of the Hamlet of Holman.

The Copper Inuit have used the native copper float found in the Natkusiak flood basalts on Victoria Island for tools since at least the start of the 20th century (Stefansson, 1913), although refining and alloying were unknown. Since the 1960's, numerous explorers have found their way to northern Victoria Island. They have looked for nickel, copper, gold, silver, and diamonds. These include:

1. Washburn (1947): first systematic geological mapping
2. Geological Survey of Canada (GSC): reconnaissance mapping by Thorsteinsson and Tozer (1962)
3. Muskox Syndicate (1968-1969): copper
4. Grandroy Mines Ltd. (1969-1970): copper
5. Panarctic Oils Ltd. (1983, 1984): copper, silver, and gold in the Holman Syncline
6. Noranda/Aber/Highwood (1993)
7. Aber Resources (1993 -1997): nickel, copper, PGMs
8. Western Mining Canada (1993-1996): nickel, copper, PGMs
9. Monopros (1994 -1997): diamond

The extremely remote setting may have contributed to the lack of success, but this has not stemmed the traffic. Today, no fewer than four explorers have active interests in the northern portion of the island.

In 2004, Great Northern Mining and Exploration (GNME) staked some 1.5 million acres from Minto Inlet to Glenelg Bay, setting the stage for what is believed to be the largest nickel-copper exploration project in Canada at the present time. In 2005, GNME commissioned over 17,000 line-km of airborne geophysics, and collected almost 4,000 geochemical samples.

The area's geology is relatively simple on a regional scale, although there are areas of local complexity. There has been gentle regional folding, forming the Walker Bay Anticline/Holman Syncline pair, striking roughly north-east/south-west and plunging gently to the north-east. Regional dips are gentle, seldom exceeding 10 degrees. This has been subsequently complicated by extensive piano-key faulting, and obscured by Laurentian till deposits.

The underlying geology consists of Precambrian sediments, primarily carbonates and evaporates with some clastic sequences. Franklin-age (c.720Ma) sills, and occasional dykes, have intruded into this setting; the mineral potential of the area stems from these mafic/ultramafic intrusions. GNME's model projects late-stage sulphide fluids pooling to form Noril'sk-style massive sulphide bodies.

The Umingmak Project is the largest mineral exploration project predominantly on Inuvialuit private land since the Environmental Impact Screening Committee was established. Therefore, in addition to geological developments, this project will provide a significant test case for both regulatory and environmental developments in the Inuvialuit Settlement Region. GNME hopes to present further on this topic in the future.

GNME is looking forward to expanded operations, including diamond drilling, in 2006 and beyond.

DEVELOPING CANADA'S NORTH: THE NEW CHALLENGE

Morison, S., Cameron, K. and Duke, J.L.
Gartner Lee Limited, Calgary, AB and Whitehorse, YT

Canada's north is entering a new era of prosperity. The success of the new diamond industry is transforming the economy in the Northwest Territories. Efforts are now underway to tap into the rich oil and gas fields and numerous mineral deposits found throughout the north. Northern governments are grappling to respond to infrastructure requirements that support development, including two proposals for gas pipelines, a railway, and numerous mining projects.

This prosperity is coming at a time of rapid political evolution. First Nations land claims are being settled at an accelerated rate. These agreements establish new orders of government with additional resource management responsibilities throughout the north. Yukon has recently assumed new responsibilities for resource management from the federal government. The Northwest Territories is entering a new era of prosperity from an emerging diamond industry and the new territory of Nunavut seeks to define its role within Canada's federation.

Natural resource projects are developed in the context of a complex weave of legislation (much of which is new) and an array of social expectations. Understanding this political and social context and the environmental issues unique to the north is essential to successfully advancing a major project.

This presentation will review the evolving political and social structures in the north, the implications northern development and offer a template for success in responding to the new challenge of advancing a northern project.

AN UPDATE ON SOUTHERNERA DIAMONDS INC. 2004-2005 DIAMOND EXPLORATION PROGRAMS

Naeher, U.
SouthernEra Diamonds Inc., Yellowknife, NT

SouthernEra Diamonds Inc. is currently operating five major diamond exploration projects in the Northwest Territories: the Yamba Lake Project, the Back Lake Project, the Lac de Gras Project, the Diavik East Project and the KIDME Joint Venture. In addition, the Company is also participating in the WO, Monument, Commonwealth and ATW projects located within the immediate Lac de Gras area.

The Yamba claim block is located between the northeast end of Yamba Lake and the southwest end of Fry Inlet, approximately 40 km northwest of the Ekati Mine. To date seven diamondiferous kimberlite pipes and two dykes have been discovered on the Yamba Property. In 2004 and 2005 SouthernEra spent a total of $600,000.00 on exploration including ground

geophysics, detailed geochemical sampling and a seven hole diamond drill program. The 2004 drill program led to the discovery of a diamondiferous kimberlite dyke. The geochemical surveys outlined two areas of high interest with high anomalous olivine and pyrope grain counts. A drill program is planned for the spring of 2006.

The Back Lake Project area is located 250 km northeast of Yellowknife, NWT and extends between Munn Lake and Back Lake. Several kimberlitic indicator trains have been discovered over the last four years and the current exploration focus is to locate the primary kimberlite sources to the indicator trains. In 2004 and 2005 SouthernEra completed detailed ground geophysical and geochemical surveys and was able to define the trains further. A drill program is planned for the spring of 2006.

The KIDME claims are located 100 km north of the community of Snowdrift NWT, approximately 20 km southwest of the Gocha'Koe Project. Two distinct indicator mineral trains transect the northern part of the property. In the fall of 2003 a DIGHEM^{Resolve} airborne survey was flown over the project area. As follow up SouthernEra completed ground geophysics on 35 grids on the property in 2004 and 2005. Several high priority targets were delineated and await drill testing in early 2006.

On the Monument Project SouthernEra established several high resolution ground geophysical surveys and drilled 11 holes to re-test the DD-42 and DD-17 kimberlites and tested further two electromagnetic anomalies. One new discovery, a feeder dyke into the DD-42 kimberlite was made. Over 600 kg of kimberlite from the DD-17 pipe are currently being analyzed for micro diamonds. The DD-39 kimberlite and several high priority anomalies will be tested in the summer of 2006 pending funding from the joint venture partners.

The Diavik East project area is located east of Lac de Sauvage on ground acquired in the spring of 2005. Several high priority targets were identified from archive airborne data. Sampling was completed in the summer of 2005. A ground geophysical program and follow up drill program is planned for the spring of 2006.

COMMITTEE BAY RESOURCES LTD. – IMPLEMENTATION OF THE POCKET PC FOR DATA CAPTURE, MAPPING AND EXPLORATION

Newman, K.[1], Martel, E.[2], Pierce, K.[2] and Irwin, D.[2]
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[2] Northwest Territories Geoscience Office, Yellowknife, NT

Committee Bay Resources Ltd. decided to implement the Pocket PC (PPC) for the summer exploration and geologic mapping program to increase data collection accuracy, consistency and rapid production of professional looking maps. Four HP iPAQ hx4700 PPCs and two Microflex 2240 ruggedized PPCs were purchased and used for regional and detailed mapping, prospecting and navigation.

The PPC has many benefits including:

- Each button for traverse, station, sample, structure, linear feature, contact, photograph and outcrop pops up a form where the user inputs their data using check boxes, drop down menus and text fields. The data that is entered into each form is linked to its own shapefile where the data is stored in an attribute table (database). This linkage makes it very simple after the data is synchronized from the PPC onto a desktop or laptop computer to be viewed in ArcMap for accuracy and consistency.
- Accuracy is improved by being able to plot points directly from the GPS and the coordinates are digitally put into the database in their own fields.
- The GPS and ArcPad forms reduce the mistakes associated with writing data down into a field book and having to enter it later into an excel spreadsheet and then having to import the data into a digital map format using the x/y coordinates.
- The data is in shapefile format right as it is entered into the PPC and the ability to synchronize directly to the desktop or laptop eases map creation.
- The synchronizing process creates a folder on the desktop that holds all of the shapefile and look up table data that can then be added to an ArcMap project. Each time the PPC is synchronized after another day in the field the new data is updated to the shapefiles and the project.

Forms and programming are always a work in progress and are constantly being changed and updated with requests from the users. Simplicity of the forms and buttons is important to facilitate all levels of users as is access to tutorials with visuals on how to use the forms and buttons.

ENHANCING GEOSCIENCE KNOWLEDGE IN NORTHERN CANADIAN COMMUNITIES: AN UPDATE

Nowlan, G.S.
Geological Survey of Canada, Calgary, AB

The Northern Resources Development Program of the Geological Survey of Canada launched a new project in 2003-2004 to enhance the understanding of geoscience in Canada's northern communities. This project, entitled Geoscience Experience for Northern Communities (GENCOM), has been going for more than two years, enough time to realize the enormity of the task at hand. There is little doubt that the key to increased prosperity in the north lies in enabling communities to participate meaningfully both in resource-based development and in the development of educational tourism. The project is attempting to provide readily understandable geoscience information to northern communities through community and school-based programs and is engaged with many partners in developing science outreach materials of general and local interest. The nature of the outreach in different projects and regions is tailored to the needs of the communities.

One of the core activities of the project is the development of fact sheets that deal with Canadian resources. Twelve of these have been produced and a further twelve are in development; a total of thirty or so are expected before the completion of the project. These will be converted to a web page in the future, embracing all aspects of minerals and energy resources, but with special emphasis on northern Canada.

New Geoscape posters are under development, notably for northern Saskatchewan, Dawson City and Nunavut; the development of a geoscape for Northwest Territories has been encouraged. Geoscape posters on energy resources and diamonds in Canada are also under preparation. A new innovation is the development of geoscape guides for smaller communities. These are developed jointly with members of the community and include booklet-style documents and mini-posters. Partners in the communities have ranged from high school classes and their teachers, to sciences centres, to local government officials.

A key aspect of the project is the development of workshops for teachers in northern communities and visits to schools in the same communities. Recent workshops include a well attended session for high school teachers in Whitehorse, Yukon, developed in partnership with a local teacher, and in High Level, Alberta for elementary teachers. Both of these workshops were paired with school visits.

A unique project conducted in 2005 is the development of interpretive signage for a fossil locality near the community of Coral Harbour on Southampton Island, Nunavut. This was conducted in collaboration with landscape architects on contract to the Nunavut government. The collaboration was very successful and may represent a new kind of opportunity for outreach in the north.

The long-term goals of the project are northern communities with better geoscience knowledge and more individual residents of northern communities who feel inspired to pursue geoscience-related careers.

VARIATION IN VEGETATION, SNOW COVER AND NEAR-SURFACE GROUND TEMPERATURES ACROSS TREELINE, IN THE UPLANDS EAST OF THE MACKENZIE DELTA

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The relations between vegetation, snow depth, and near-surface ground temperatures were investigated at 7 upland sites along a 130 km transect across treeline from Inuvik to the Beaufort Sea coast. Understanding which factors influence near-surface ground-thermal conditions across treeline is required for planning and managing development of the proposed Mackenzie Valley pipeline, which will cross this ecological transition northeast of Inuvik. A “Roughness Index”

(RI) was developed to characterize the snow holding capacity of vegetation cover measured along transects established at each site. This index integrates vegetation height and structural complexity as determined through the LAI-2000 Plant Canopy Analyzer, by multiplying mean maximum vegetation height by canopy cover.

Comparison of data from along the transect shows that late-season mean snow depths are strongly correlated with mean RI, both following a decreasing trend northward across the boreal-shrub tundra-low shrub tundra transition. The boreal forest site (T1) exhibits the highest mean RI and mean snow depth. The site is characterized by scattered black spruce between 0.5 and 5.2 m in height. Mean RI and mean snow depth are lowest at Illisarvik, the low shrub tundra site near the Beaufort Sea coast.

A steep decrease in RI and snow depths was observed between approximately 18 km and 28 km north of Inuvik, between sites T2 and T4. Site T2 was burned by wildfire in 1968 and has recolonized with thick, densely growing alder and willow up to 2.3 m in height. The mean snow depth at T2 was 74cm and at T4 it was 45 cm. There is a gradual decline in RI and snow depth north of the shrubline, from T4 to Illisarvik, reflecting the northward decrease in shrub size and snow holding capacity of the vegetation.

South of the shrubline, structurally complex vegetation minimizes snow redistribution by winter winds, thus snow depths reflect regional precipitation patterns and do not vary significantly between sites. Within site variation in snow depths was greatest at the shrubby tundra site (T3 standard deviation = 28.3) where large alder shrubs are interspersed with shorter dwarf birch tundra vegetation. Deep snow drifts accumulate where large structurally complex vegetation is present and thin snow depths occur where large shrubs are absent. Variation in annual mean near-surface ground temperatures at the top of permafrost is generally associated with snow accumulation. Ground temperatures generally decrease with distance from Inuvik along the transect, from -3.9 ^{o}C at Inuvik to –6.7 ^{o}C at T6, a difference of 2.8^{o}C over 86 km.

SCOPE AND MINERAL POTENTIAL OF A NEW GRANULITE DOMAIN IN THE SOUTHERN RAE: SURPRISES FROM "ARCHIVAL MAPPING" OF THE SOUTHEAST FRONTIER OF THE NWT

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The southern Rae domain of the Northwest Territories remains one of the poorer known portions of the Churchill Province, having been last systematically mapped during Operation Thelon of the late 1950's. Modern work by the Northwest Territories Geoscience Office and the Saskatchewan Geological Survey on the southern and eastern flanks of the domain forms the backdrop to a new re-evaluation of the GSC's archival data.

Utilizing archived maps, photographs, field notes and samples in the National Reference Collection we identified a hitherto unrecognized granulite domain in the southern Rae, that is the northern and western extension of the Selwyn lozenge in southeastern NWT. The Chipman shear zone, which separates high pressure (min. 10 kbar) rocks of the Rae from the lower grade Hearne, can be traced through the Boyd Lake area to Angikuni Lake. Mineral assemblages from ortho- and paragneiss samples of the Boyd, Kamilukuak and Carey Lake sheets are consistent with a broad region of high pressure granulite-facies rocks bordering the Hearne. Farther west and bordering Saskatchewan the rocks consist of interference-folded, moderate-pressure granulite-facies sequences of a) mafic to intermediate paragneisses, semipelites, and iron formation; b) distinctive blue-quartz-bearing migmatitic psammopelites, diatexite, with rare quartzite, conglomerate, calc-silicate, ultramafic lenses and iron formation; and c) panels of intermediate to felsic orthogneisses. The above sequences are cut by a previously unreported, north-trending, metamorphosed mafic dyke swarm, possibly related to the Kazan dykes of the Angikuni area or the Paleoproterozoic Chipman dykes. Occurrences of Baker Lake group sedimentary and hypabyssal intrusive rocks are found as scattered outliers in the Boyd and Carey Lake sheets. The quartzite-bearing metasedimentary sequence is thought to be likely Paleoproterozoic in age. P-T and age determinations are underway to characterize this domain and further constrain tectonic models for this region for which there are no Ar-Ar, Sm-Nd or U-Pb isotopic data.

The granulite domain is bordered on its northwestern margin by the Howard Lake shear zone, an over 500 km long by 10 km wide zone of ductile high strain extending from Manchester Lake to the Thelon Basin, where it was noted by Gandhi and Roscoe during reconnaissance mapping for uranium potential. West of the shear zone rocks of the southwestern Rae comprise unmetamorphosed Nonacho group sediments, greenschist to amphibolite-facies metasedimentary rocks assigned to the Amer group (white and pink quartzites, sulphidic and graphitic semi-pelites, rare iron-formation and plagioclase-phyric basalts) and a variety of heterogeneously sheared, interpreted Archean, ortho- and paragneissic rocks and granitoids. Rocks west of the Howard Lake shear zone show no mineralogical evidence for high-pressure metamorphism, consistent with significant offset on the structure.

Of key significance to exploration is the identification of numerous gabbro, anorthosite, diorite and monzodiorite bodies intruding the southern Rae. In several instances the archived hand samples contain trace to 2% sulphides, including phyrrhotite and chalcopyrite. Such mafic magmatism is presently a major target for Ni-Cu-PGE mineralization in the Thye Lake (NWT) and Axis Lake (Saskatchewan). One implication of the recognition of moderate-grade metamorphosed Paleoproterozoic cover as basement to the Nonacho group, is that the Nonacho group must post-date Taltson magmatic zone magmatism and metamorphism and hence did not form in a Taltson-related strike-slip basin. A number of features of the archival collection raise questions about the interaction of the Slave province, western Rae and Talston magmatic zone.

DO27 – A NEW CHAPTER IN AN EVOLVING STORY

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The DO27 kimberlite was discovered in 1993 by Kennecott Canada Exploration (KCEI) in joint venture with DHK Resources, Aber Resources and SouthernEra Resources. It is a fairly large kimberlite, with an estimated surface area of 9 hectares. Early microdiamond results were sufficiently encouraging to warrant the development of a decline which was driven into the outer portion of the pipe and from which 5008 tonnes of kimberlite were extracted, of which 4261 tonnes were processed. The results from this sample were released in August of 1994 – 3000 tonnes of pyroclastic kimberlite gave an average grade of 0.36 carats/tonne with an average value of $21/carat, while 1260 tonnes of hypabyssal kimberlite returned a much lower grade. The project was shelved.

Between 1994 and 2005, essentially no work was done on the DO27 kimberlite. The property was returned to the original junior joint venture partners, who maintained that the high grade portion of the pipe was never tested. Archon Minerals and BHP Billiton Diamonds (BHPB) acquired interests in the pipe and in 2004, Peregrine Diamonds Ltd. acquired BHPB's position. A careful review of the data suggested that DO27 is a complex body comprising a main vent and a subsidiary northeastern vent. The material sampled in 1994 was mainly from the northeast subsidiary vent and surrounding hypabyssal dykes/sills. The inferred high-grade material from the main vent did not appear to have been adequately tested.

In 2005, Peregrine undertook a mini-bulk sample to test the inferred high-grade material that was not sampled in the 1994 program. In February/March, 150 tonnes of kimberlite were collected from the central portion of the main vent by drilling 6 large diameter RC holes. Five holes intersected clay-rich kimberlite containing abundant chrome diopside and pyrope but little fresh olivine (sample PDL-1). The sixth hole intersected clay-rich kimberlite with abundant fresh olivine (sample PDL-2). Subsequent core drilling confirmed these geological differences. A sequence of well layered pyroclastic tuffs was intersected in the chrome diopside - pyrope dominated areas, while largely massive, structureless pyroclastic kimberlite was found in the olivine dominated region.

Sample PDL-1 returned an average grade of 0.98 cpt and sample PDL-2 returned 0.70 cpt. Twenty-one stones weighing over one half carat were recovered, the largest of which weighed 2.93 carats. Three separate fair market, non-modeled valuations were performed on the diamonds. Parcel PDL-1, which comprised 78% of the total carats recovered was valued at $US 58.54 to $77.77 per carat, while the total parcel was valued between $US 53.21 and $67.20 per carat.

The original hypothesis of a high grade zone existing within DO27 has been tested and proven correct; however a number of questions remain. In moving forward, Peregrine has completed a core drilling program to better understand the internal geology and its relation to diamond distribution in DO27 and the adjacent DO18 kimberlite. An aggressive program is planned for 2006 that will include core drilling and large diameter RC drilling to develop an improved

understanding of the geology, grade distribution and value of the diamonds within DO27 - the results of which will constitute the next chapter in this evolving story.

NEW GEOSPATIAL DATA INITIATIVES TO BENEFIT NORTHERN CANADA

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This presentation will address initiatives intended to provide new and improved geospatial data for the northern territories and the rest of Canada. These activities are conducted under the Geomatics for Northern Development (GND) and the Geomatics for Sustainable Development (GSDNR) programs of the Earth Sciences Sector, Natural Resources Canada. Initiatives include the Northern Mapping project, the Medium Resolution Imagery project, the National Hydro Network development and the RADARSAT-2 proposal. The status of current projects and data production will also be covered.

2005 RECONNAISSANCE PROGRAM: REGIONAL GEOSCIENCE STUDIES AND PETROLEUM POTENTIAL, PEEL PLATEAU AND PLAIN

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Peel Plateau and Plain (Peel Region) lies along the northern Mackenzie Corridor. Peel Region has widespread hydrocarbon potential, but is under-explored and its geological history is poorly understood. Much of the bedrock mapping and exploration drilling in the area dates back to the 1960's. More than 70 exploratory wells have been drilled in Peel Region. Some wells had encouraging hydrocarbon shows, yet no major discoveries. The primary objective of this new multidisciplinary, collaborative four-year project is to improve knowledge of regional geology, including stratigraphy and correlation, depositional and tectonic histories, basin evolution, and petroleum geology and potential. The project is seamless across the NWT-YT border and utilizes the expertise of partners in the Geological Survey of Canada, Northwest Territories Geoscience Office, Yukon Geological Survey, universities, northern communities, and industry. New geological knowledge in Peel Region is necessary to stimulate petroleum exploration, industry investment, and economic development for the benefit of Northerners.

A reconnaissance program in the summer of 2005 focused on geology along the Dempster Highway, as well as remote regions of the Richardson Mountains and northern Mackenzie Mountains. The Dempster Highway from Inuvik, NWT to Eagle Plains, YT transects the

northwest corner of Peel Region and exposes strata spanning the Proterozoic to Quaternary. Geological data were collected at 25 stops in order to update a now out-of-print roadside geological guide for the Dempster Highway. Helicopter reconnaissance work took place along river exposures in Peel Region and along the deformation fronts that flank the western and southern edges of Peel Plateau (Richardson and Mackenzie Mountains, respectively). Parts of Trail River (NTS 106L), Snake River (NTS 106F), Ramparts River (NTS 106G), and Sans Sault Rapids (NTS 106H) map areas were covered. In total, 17 stratigraphic sections containing 16 different formations of Neoproterozoic to Cretaceous age (900 to 100 Ma) were examined. Six of the sites represent type localities. Preliminary collections from key sections included: 1) representative lithological samples for sedimentology; 2) Paleozoic carbonate rock for conodont microfossil analysis; and 3) Paleozoic and Mesozoic black shale for organic geochemistry analysis (Rock-Eval/TOC pyrolysis). Reconnaissance data provide a framework for further evaluating prospective stratigraphic horizons (source and reservoir facies), dating formations using biostratigraphy, and assessing hydrocarbon potential of various formations.

Reconnaissance work in Peel Region suggests an east-west transect along the deformation front of the Mackenzie Mountains will improve stratigraphic correlation between exposures at surface and existing well and subsurface data of Paleozoic Mackenzie-Peel Shelf and Mesozoic Peel Trough. Study of correlative strata in the Richardson Mountains (Richardson Trough) that flank Peel Region to the west will give a more complete picture of the basin, its deformation history, and tectonic evolution. Both regions require detailed investigations of sedimentology, stratigraphy, biostratigraphy, sequence stratigraphy, structure, and regional thermal maturity.

Visit *www.nwtgeoscience.ca/petroleum/PeelPlateau.html* for project updates, products, and participant information.

AN UPDATE ON THE CANADA MINING REGULATIONS

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In the Northwest Territories (NWT) and Nunavut, the federal government, through Indian and Northern Affairs Canada (INAC), is responsible for the management of Crown lands, including minerals, through the Territorial Lands Act and its Regulations, which include the Canada Mining Regulations (CMR). The CMR were last completely revamped in 1977 and, in 1999, amendments were made to royalties provisions to prepare for diamond production in the NWT.

The current initiative to amend the CMR began in July 2000, when INAC consulted informally with stakeholders on the necessity for the modernization of certain provisions. A first set of draft amendments was completed by December 2002 and circulated to more than 1800 stakeholders for comments and input. In 2004, in order to facilitate the legislative process, it was decided to divide the comprehensive package of amendments into two separate groups: one dealing with royalties and some leasing provisions and the other dealing with the balance of the amendments to the mineral tenure regime. INAC is now also proposing that the second package of

amendments create a separate mining regulation for each territory. Thus, the existing 'Canada Mining Regulations' would be replaced by the 'NWT Mining Regulations' and the 'Nunavut Mining Regulations' to prepare for devolution and to take into account the legislative differences between the two territories.

The majority of modifications proposed in the current review are administrative in nature and there are no major changes to the fundamental policies underlying the regulations. The amendments to the provisions on royalties and leases clarify wording and include changes allowing the Crown to deal with claims and leases acquired through insolvency proceedings and the realization of security. They also provide consistency with the implementation of comprehensive land claim settlements, in indicating the royalty allocations for mines on a mix of Crown lands and Aboriginal owned lands. The proposed changes to the mineral tenure regime allow for the clarification and streamlining of provisions dealing with the acquisition of mineral rights, metrification, time specification for work approval and claim recording, limitation of the discretionary powers of government officials and updating of various administrative procedures.

The first package for the royalty and lease provisions should go to pre-publication in the Canada Gazette in the next few months, which will then be followed by a 30 day period of further public comments. The Mineral Resources Directorate is continuing to work with the INAC Regional Offices, the Department of Justice and its legal services to resolve outstanding issues and to develop final drafting instructions. Once the draft on the mineral tenure package is completed, INAC is committed to conducting the appropriate consultation with stakeholders and to develop provisions that are respectful of their considerations.

The proposed amendments will ensure that the regulations continue to enable efficient and fair management of the disposition of mineral resources in the NWT and Nunavut until such time as responsibility for this activity is transferred to the relevant territories and agencies through devolution.

URANIUM EXPLORATION IN THE PROTEROZOIC LOWER HORNBY BAY GROUP, EASTERN HORNBY BAY BASIN, NUNAVUT AND NORTHWEST TERRITORIES, CANADA: SIGNIFICANCE OF NEW STRATIGRAPHIC, LITHOLOGIC, AND STRUCTURAL DATA.

Ramaekers, P.
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Hornby Bay Explorations Ltd. has an ongoing uranium exploration program in the eastern Hornby Bay Basin (Bigbear Basin) and its associated outliers. The program consists of stratigraphic and structural mapping, a regional lithogeochemical survey, geophysical work and a drilling program. Preliminary result indicate that both the Bigbear and Lady Nye formations are widely present. The Bigbear Formation consists of a basal northwesterly derived conglomerate that fine up to sandstones and to a thick mudstone in the central and southeastern parts of the

Bigbear Basin. Overlying this are several cycles consisting of thin basal sheet conglomerates, locally thickening in channels, that fine up medium-grained well-sorted sandstones. In the northeastern half of the Bigbear Basin a section of up to at least 600 m of well-sorted medium grained sandstone is present with minor thin mudstones at its base. Whether this unit overlies the conglomeratic section present in the southwestern half of the basin or is its lateral equivalent has not been established. The lower non-marine members of the Lady Nye Formation are present throughout the northern half of the Bigbear Basin and overly the Bigbear Formation with a significant unconformity. They contain a number of conglomeratic and diamictic units. The basal ones consist largely of rounded clasts of medium-grained well-sorted sandstone, similar to that of the Bigbear Formation. The coarser units higher up contain progressively less sandstone clasts and an increasing percentage of quartz-pebbles. The bulk of the Lady Nye Formation in the Bigbear Basin consists of well-sorted medium grained sandstones. How to distinguish these from the basal quartz arenites of the unconformably overlying Dismal Lakes Group is under investigation. Bigbear sandstones are arkosic with a decreasing percentage of feldspar higher in the section. This trend continues in the Lady Nye sandstones, and the basal sandstones of the Dismal Lakes Group are quartz arenites.

The Bigbear Basin is moderately faulted and deformed; much of the basin shows shallow dips to various directions, but grabens outlined by strata dipping to 40 degrees are present. Prominent northeast and southwest fault sets are present with offsets in excess of 100 m in places. The relatively narrow (1-3 km) flanking basins and outliers contain gently dipping Bigbear Fm sections that are in excess of 600 m thick in places.

Alteration (bleaching, clay alteration, anomalous uranium content, malachite staining) is most common in the more quartzitic upper stratigraphic units of the Bigbear Formation, and in major fault zones throughout. It is less common in the more clay rich lower units of the Bigbear Fm in the southwestern half of the basin. The more quartzitic upper stratigraphic units of the Bigbear Formation appear to overlie the basement directly in the eastern part of the Bigbear Basin and also are in fault contact with basement there. A number of bleached zones with anomalous uranium content are present in this area.

DEVELOPMENT AND REGIONAL SETTING OF THE PROTEROZOIC HORNBY BAY, THELON, AND ATHABASCA BASINS, NUNAVUT, NORTHWEST TERRITORIES, SASKATCHEWAN AND ALBERTA, CANADA: SIGNIFICANCE FOR URANIUM EXPLORATION.

Ramaekers, P.
MF Resources Inc., Calgary, AB

The Hornby Bay, Athabasca and probably the Thelon Basin are complex basins whose stratigraphy reflects their evolution through multiple orogenic episodes that were part of the assembly of Laurentia. The distance to the causal orogen varied from adjacent to very distant for different sequences within each of these basins.

The apparent lithologic simplicity of the Athabasca and Thelon basins resulted in part from a long diagenetic history during which all but the ultrastable minerals were altered to clay and silica.

Unconformity uranium deposits in the Athabasca Basin formed in major shear zones, and (including all the large deposits) where basin margin parallel basement faulting was preferentially and repeatedly reactivated during cycles of deepening and unroofing of the basin after deep burial.

The potential for development of Athabasca Basin type unconformity uranium deposits in the Hornby Bay and Thelon basins will be examined in the light of the developmental histories of the three basins.

AREVA'S KIGGAVIK-SISSONS PROJECT: NUNAVUT'S LARGEST KNOWN URANIUM DEPOSITS

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AREVA (COGEMA Resources Inc.) Vélizy, France

The Kiggavik-Sissons Project is located approximately 80 km west of Baker Lake, Nunavut. COGEMA Resources Inc., a subsidiary of AREVA, is the majority owner and operator. The properties comprise 37 mineral leases and 3 claims for a total of 18,717 hectares.

Uranium in the area was identified when radioactive frost boils and rock chips were discovered at Lone Gull (Kiggavik) during systematic coverage with an airborne radiometric survey carried out by Metallgesellschaft Canada Ltd. in 1974 (succeeded by Urangesellschaft Canada Ltd. (UGC) in 1975). Drilling at Kiggavik commenced in 1977 and led to the discovery of the Main Zone mineralization. By 1985 the regional programs were terminated and UGC started to concentrate most of its work on the Kiggavik deposit. Airborne resistivity lows at End Grid and Andrew Lake were followed up by ground gravity surveys and the resulting anomalies were drilled. Uranium mineralization at End Grid and Andrew Lake was discovered in 1987 and 1988 respectively. Delineation of these two deposits was the focus of drilling up to 1993.

COGEMA became the operator of the project in 1993. Exploration targets were defined by resistivity lows and gravity anomalies. Delineation drilling in 1997 completed the definition of the Andrew Lake deposit. A pre-feasibility study was also completed in 1997, and concluded that the deposits were not economic given the market conditions at that time. The project has been in care and maintenance mode since 1998.

The deposits occur in the Woodburn Group, mostly within greywackes, and are found along a linear NNE trend identified by a magnetic low. The present-day Thelon sandstones lie to the north of the deposits. It is thought the basement-hosted mineralization was formed in its present

day location by mixing of oxidized fluids from the sandstones (which once overlay the basement lithologies) and reduced fluids from the basement.

The geological resources for the Kiggavik-Sissons Project are estimated at 50,630 tU and are summarized as follows:

- Kiggavik Deposit 14,872 tU @ 0.385%U
- Andrew Lake Deposit 22,160 tU @ 0.444%U
- End Grid Deposit 13,598 tU @ 0.281%U

Current activities are focussed on consultation with the various stakeholders in Nunavut. The objective is to increase the awareness of the potential social and economic benefits of uranium mining in Nunavut and the global demand for nuclear energy. Several groups comprising representatives from Inuit Organizations, Territorial and Federal Governments, and a number of public Boards and Commissions have visited uranium mining operations in Saskatchewan where the modern uranium industry has demonstrated over 25 years of high levels of protection of workers and the environment. AREVA will continue to work with all stakeholders to advance a uranium policy which is in support of uranium mining in Nunavut. The development of the Kiggavik-Sissons Project would be the first step to establish Nunavut as a uranium producer. AREVA's commitment to sustainable development would bring benefits to Nunavut residents, while respecting and preserving traditional values and land usage.

UNIVERSITY OF ALBERTA'S 2005 NWT FIELD SCHOOL: EXPERIENCING BEDROCK MAPPING FIRST-HAND

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In 2005, University of Alberta's Department of Earth and Atmospheric Sciences based their annual 4th-year bedrock mapping field school at Aurora College's camp on Tsu Lake, NWT. The camp, located about 60 km north of Fort Smith, is the base from which the college delivers the field component of their Natural Resources Technology Program (NRTP), and was an excellent facility from which to run the field school.

While the opportunity to use the NRTP camp was appealing from a logistical perspective, the local geologic setting was poorly-known compared to the Slave craton where the previous two field schools were located. Tsu Lake sits within the Paleoproterozoic Taltson Magmatic Zone, and information provided by NRTP staff suggested outcrop was abundant and well exposed. Based on this advice, coupled with geologic information from regional GSC maps and a petrologic study of metamorphic rocks from the area, a decision was made to map in a new, relatively unfamiliar, terrane. We were not disappointed: the ten days spent mapping in the area barely scratched the surface in terms of identifying research opportunities.

The geology at Tsu Lake features a well-exposed section across a package of mixed paragneisses that are intruded by multiple generations of granitiod rocks. A previously-undocumented zone of mylonites transects the map area, and preserves evidence for a prolonged and complex displacement history. Diabase dykes with spectacular primary emplacement textures were observed, and the mineral potential of late quartz veins and silica flood zones remains largely untested.

Although the U of A geology course and the NRTP programs were not formally integrated, by sharing a single camp, students from both programs had the opportunity to witness another discipline's field work and culture. Sharing the facilities reduced costs for the College, and helped the U of A leverage funds from the Canadian Polar Commission, whose mandate supports partnership opportunities between northern and southern educational institutions.

INTRODUCING KAMINAK GOLD CORPORATION: A NEW APPROACH TO EXPLORATION IN THE NORTH.

Robins, J.E. and Carpenter, R.L.
Kaminak Gold Corporation, Vancouver, B.C.

Kaminak Gold Corporation is a new mineral exploration company formed through the combination of the non-diamond assets of privately held Hunter Exploration Group together with the non-diamond assets of Shear Minerals Ltd. As a result, Kaminak holds one of the largest land positions in Canada devoted to metallic mineral exploration. The Company's Kivalliq and West Kitikmeot projects offer world-class exploration potential and present exposure to strategic commodities including, gold, uranium and nickel.

Kaminak is taking advantage of unique agreements with diamond explorers Shear Minerals Ltd and Indicator Minerals Inc. whereby Kaminak can use vast technical datasets from Shear and Indicator for non-diamond exploration. Access to this information is at no cost to Kaminak. Through these agreements Kaminak has gained free access to over 10,500 archived till samples and 75,000 line kilometers of high-resolution airborne geophysics, as well as GIS databases, geological maps and compilations. Much of this data was collected on prospective and previously unexplored ground near the Meliadine Gold Camp in Nunavut (5,000,000 ounces of gold). Till sampling has proven to be an invaluable tool for gold exploration at Meliadine and analyzing archived till samples for gold will help Kaminak generate new gold targets in this Gold District. These agreements have given the Company exposure to over $20 million worth of third party expenditures.

Kaminak owns 100% of 8 properties in Nunavut and also holds a 20% interest in the MATRIX Gold Project also located in Nunavut. The Matrix Gold Project is currently under option to global gold producer Newmont Mining Ltd. This project is focused on discovering analogues to the prolific Witswatersrand gold deposits of South Africa (>1,000,000,000 ounces of gold). Kaminak's dominant land position and diverse property portfolio allows the Company to take

advantage of strategic commodities, including gold, uranium and nickel. For example, Kaminak holds the uranium rights to over 75 kilometers of the Baker Lake unconformity. Minor historical work on Kaminak's ground identified over 25 individual uranium showings which remain untested.

Recent field work on the Company's 100% owned LACH property in the northern part of the Slave Province has identified a significant new gold zone associated with major first-order Proterozoic fault zones. This style of gold mineralization has largely been overlooked in the region and results to date suggest high potential for further discoveries on the property.

FROM KLONDIKE TO CANTUNG: GEOINFORMATION FOR YUKON FOLKS AND THEIR KIDS

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Yukon is relatively lightly populated (30,000) and local public opinion is influential in development decisions regarding natural resources in the hinterland. Staff of the Geological Survey of Canada and the Yukon Geological Survey work collaboratively to provide relevant, un-biased geological information to residents for a variety of purposes from scientific curiosity to land use issues. Posters, brochures, public lectures and signage, recreation maps and media spots are important elements of our mandate. We fill requests from teachers through Innovators in the Schools (supported by Yukon College). School field trips to local geological features peak in May and September. During the annual Mining and Geology Week we conduct an open house for the public to see what geological surveys do.

An EdGEO workshop in April drew 19 teachers from Whitehorse, Watson Lake and Faro for a one-day tour through the new (BC) earth science curriculum for grades 8-10. Up-to-date reference materials, starter kits of minerals and fossils, printed information on classroom demonstrations and regional geologic features were provided, and teachers praised this inspiring approach to the subject.

Geoscape Whitehorse, one of the national poster series (http://geoscape.nrcan.gc.ca), uses attractive diagrams to explain geological processes to people where they live. We have expanded five of the poster's themes into colour brochures for public interest and classroom use. In addition, derivative images were used by Environmental Health Services to illustrate points of possible groundwater contamination, and by the Habitat coordinator of the City of Whitehorse to explain glaciation in its interpretive signage. Images created for the Geoscape poster are easily incorporated into presentations of the local geology.
Geoscape Dawson poster (in preparation) addresses placer gold mining in the Klondike, reclamation of a nearby heap-leach gold mine, the Pliocene-Pleistocene ice-free continent of Beringia, and the influence of local geology on the town. Drafts displayed at local trade shows

allowed constructive comments on design and content. The poster is for both residents of Dawson (population 2,000) and visitors eager to explore its surroundings.

In the town of Watson Lake (population 1700) a grade 10/11 science class produced a geoscape-style brochure. They collected information during a week of field trips and classroom presentations. The community supplied nearby mines at Cassiar (BC), Cantung (NWT) and Sa Dena Hess (formerly Mt. Hundere; Yukon). The students visited a sand and gravel operation, a slough along the Liard River and a water treatment plant, and talked with local prospectors. Such a class-project could be staged in another community to stimulate awareness of its geological surroundings.

Geo-education in Yukon capitalizes on our distinguished mining history (offspring of prospectors in almost every class!), and demonstrates the influence of rocks and minerals upon our civilization. We can promote better understanding and reduce mis-perceptions about natural phenomena. This knowledge benefits citizens, particularly those of the fourteen self-governing Yukon First Nations, when asked to make decisions regarding natural resources in their communities and hinterland.

PRELIMINARY RESULTS OF REGIONAL BEDROCK MAPPING OF THE KUGAARUK (57A), RAE STRAIT (57B), AND HARRISON ISLANDS (57D) MAP SHEETS, BOOTHIA MAINLAND AREA, KITIKMEOT REGION, NUNAVUT

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The multi-year Boothia Peninsula Integrated Geoscience Project was launched in 2005, focusing this year on parts of NTS map sheets 57A, 57B and 57C in the Boothia Mainland area. Field work included 1:250 000-scale bedrock mapping in addition to local, detailed surficial mapping and ice-flow studies (T. Tremblay, this volume). The mapping follows acquisition of a new aeromagnetic survey completed in March 2005 (released April 2005). In advance of the field work, a comprehensive remote predictive map for the region was produced, which assisted in developing a more strategic approach to bedrock mapping. The region has significant exploration potential for diamond and precious-metal deposits.

The study area includes part of the north-central Rae domain of the Northwest Churchill Province. The bedrock geology can be broadly divided into three main lithologic associations including: 1) supracrustal rocks of presumed Archean age and possibly equivalent to the Prince

Albert Group, 2) variably deformed and metamorphosed metaplutonic rocks that intrude the aforementioned supracrustal rocks and dominate the bedrock geology of the region, and 3) rare occurrences of a marble - quartzite dominated succession provisionally interpreted to be Paleoproterozoic and tentatively correlated with the Chantrey Group (see Kraft et al., this volume). The three lithologic associations and their contained tectonic structures are cut by three sets of undeformed mafic dykes. The Archean supracrustal rocks form narrow, northeast striking and highly dismembered belts consisting mainly of psammite, semi-pelite, metabasite, local ultramafic horizons, and sulphide-bearing (lean) iron formation. The metaplutonic rocks, inferred to be late Archean, are dominated by biotite +/- hornblende monzogranite, but are polyphase and range in composition from diorite to syenogranite. The state of strain varies regionally; rocks are mainly massive in the southwestern part of the study area, and are strongly gneissic and highly strained in the east and north part of the study area.

In the study area, metamorphic grade varies from middle- to upper-amphibolite facies in the southwest, to granulite facies in the north and northeast. The granulite-facies rocks are characterized by opx-cpx-grt in metaplutonic rocks, and bio-grt-sil-crd-ksp in metasedimentary rocks. In the central and southern portions of the study area, there is local preservation of granulite-facies assemblages, suggesting that granulite-facies rocks may have been more widespread than their present distribution.

The dyke swarms consist of unmetamorphosed basalt to gabbro, and are NW, E, and ENE striking. Pronounced aeromagnetic signatures mark the three sets, but the dykes are not well exposed in the field. The NW-trending dykes are probably part of the ca. 1267 Ma MacKenzie Dykes. The unnamed E and ENE sets have not been previously reported, and are cut by the NW-striking dykes.

2005 COMMUNITY MAPPING PROGRAMME: TSIIGEHTCHIC, NWT.

Schreiner, D.
Northwest Territories Geoscience Office, Yellowknife, NT

The NWT Geoscience Office has an active Outreach program that provides geological information sessions to local schools, communities and interest groups. One of the field-based educational programs offered is the Community Mapping Program. The purpose of the mapping program is three-fold: to garner student interest in science and geology by creating an understanding of their local geology, to engage the community in sharing knowledge of their area and to provide an educational poster that the school, community and tourists can use.

2005 was the 3rd year that the mapping program was offered. After seeing a presentation on the previous year's programs, representatives from the community of Tsiigehtchic approached our office proposing to have the program run in their community. The community hired the geological assistants and guides to work on the project. An open house was held in the

community during the mapping project to share the information being gathered, and people were encouraged to bring their questions forward and add their knowledge to the project.

The project involved teaching basic geological mapping skills, rock and mineral identification, compass traversing, sample collection, GPS usage, digital photography, and landforms and glacial feature identification. GIS basics were also taught to the two assistants.

The Tsiigehtchic community poster will consist of a geologic map, descriptive notes and photographs and will focus on the geology, geological processes, landforms, historic sites and other areas of interest described by the community. The poster will be distributed to the community and a presentation will be given at a community open house to the general public, Band council and the school. The poster and information on the mapping program will be posted on the Northwest Territories Geoscience Office website, and graphics, text and html files will be supplied to Tsiigehtchic for their website.
It is hoped that this hands-on experience will foster an interest in careers in science and technology and provide a better understanding of the natural features of the area to community members.

NEW GUIDELINES FOR ENVIRONMENTAL ASSESSMENT IN THE MACKENZIE VALLEY

Schuh, R.
Mackenzie Valley Environmental Impact Review Board, Yellowknife, NT

This presentation will outline the two new sets of guidelines the Mackenzie Valley Environmental Impact Review Board has developed or are in the process of developing for environmental impact assessments in the Mackenzie Valley.

The first set of guidelines that will be discussed are the "Socio-Economic Impact Assessment Guidelines", a draft of which will be available for public review in late 2005, and which the Review Board hopes to finalize and release in the spring of 2006. Socio-Economic Impact Assessment (SEIA) is the evaluation of proposed developments to see if it is possible to reduce/prevent any social, economic and cultural impacts development might have on individuals, their families and communities. SEIA identifies possible changes a development could make in an individual's culture, day-to-day activities, and quality of life. SEIA also predicts the impact of such changes, and identifies ways to reduce or prevent impacts that might harm a person or community. Good SEIA requires that all impacts, whether good or bad influences on communities, must be assessed before a decision is made on whether the project should go ahead, and if so under what conditions. The "Mackenzie Valley Resource Management Act" requires that the Review Board considers the social, economic and cultural well-being of the residents and communities of the Mackenzie Valley. However, the Review Board recognizes that traditionally, environmental assessments have focused on the biophysical environment. The "Socio-Economic Impact Assessment Guidelines" are aimed at providing

developers and assessors/regulators tools and a list of clear expectations with which to conduct more effective SEIA. They will also help prepare communities and government to more effectively follow and participate in social, economic and cultural aspects of EA. To date, many different groups and organizations representing various interests from around the Mackenzie Valley have contributed in the development of these guidelines.

This presentation will also provide a brief overview of the Mackenzie Valley Environmental Impact Review Board's "Guidelines for Incorporating Traditional Knowledge into Environmental Impact Assessment". These guidelines were released in the summer of 2005 after an extensive public review. These guidelines clarify how the Review Board will meet its legislated requirement to consider traditional knowledge equally with scientific information. These guidelines explain to developers how they should incorporate traditional knowledge in their project design and demonstrate that effort to the Review Board. As well, they offer guidance for communities who want to bring forward any additional traditional knowledge for the Review Board to consider during an environmental assessment.

QUEEN MAUD BEGINS TO REVEAL

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The Queen Maud Block (QMB) located in North central mainland Nunavut, occupies a key tectonic position between the Slave and Churchill cratons. Reconnaissance mapping in the early 1960's described the QMB as a high-grade gneiss terrane, yet despite its possible importance to understanding the assembly of northwestern Laurentia, the area has, for logistical and geopolitical reasons, seen very little geological study since that time. The early mapping, combined with geophysical datasets and investigations in adjacent areas, provided the basis for current geotectonic models. One model predicts that the QMB is analogous to a deeply eroded Tibetan Plateau, formed as a result of 1.9-2.0 Ga collision between the Slave and Churchill cratons. In this model, high-grade metamorphism in the QMB is inferred to be concurrent with Paleoproterozoic metamorphism and magmatism in the Taltson-Thelon orogenic belt (TTO). An alternative hypothesis proposes that assembly was earlier, that the TTO is intracontinental in nature and, that high-grade metamorphism in the QMB likely preceded TTO orogenesis.

A helicopter-sampling program was completed in the summer of 2004, providing reconnaissance coverage of the eastern QMB and immediately adjacent Churchill craton. 52 samples were collected for petrological, geochemical and geochronological investigation. The most interesting results so far have come from U-Pb dating of zircon and monazite carried out, in-situ, on standard petrographic thin sections using a laser ablation multi-collector ICP-MS. The analyses give no indication of 1.9-2.0 Ga magmatism or metamorphism in this part of the QMB. Rather, the data document two distinct tectonothermal events in the area. Deformed granitoids yield igneous crystallization ages of ca. 2440 to 2480 Ma with coeval monazite growth in

metasedimentary rocks. A second event, recorded in metasedimentary rocks, yields monazite ages of ca. 2370 Ma both from homogeneous grains and from overgrowths on older monazite cores. In one case, the younger monazite ages occur in undeformed migmatite leucosomes containing the mineral assemblage garnet-cordierite-k feldspar. This indicates that the ca. 2370 Ma monazite age represents the time of a widespread granulite-facies metamorphic event in the region. Whole-rock Sm-Nd isotopic results indicate that the QMB rocks were derived from precursors extracted from a depleted mantle at ca. 3.1-2.8 Ga. The Nd model ages and our derived ca. 2370 Ma metamorphic ages are similar to those reported from the southeastward-lying western Churchill craton. The widespread, ca. 2.45 Ga igneous crystallization ages, however, appear to be a defining unique feature of the QMB.

AN OVERVIEW OF CARBONATE HOSTED ZN-PB SHOWINGS IN THE MACKENZIE MOUNTAINS, NWT

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During the exploration boom of the 1970's, numerous zinc-lead showings were discovered in a belt of Proterozoic to Devonian carbonate rocks forming the Backbone Ranges of the Mackenzie Mountains of the western NWT. The Zn Belt is 250 km in length and 50 km wide within a sequence of carbonate rocks that underwent folding and thrusting in the Late Cretaceous to Tertiary forming NW trending mountain ranges separated by broad river valleys.

Interest in the Zn belt waned in the 1980's as Zn and Pb prices maintained their downward trend, leading to the abandonment of all mineral title by the original owners. One of the highest profile discoveries was the Gayna River Zn-Pb deposit where Rio Tinto Canadian Exploration Ltd. drilled 28,000 m in over 177 holes between 1975 and 1979. Welcome North Mines Ltd. was very active in the area and discovered many of the showings. Other large companies such as Teck Cominco Limited and Serem Ltd. carried out major exploration and drilling programs in the Zn Belt.

Recognizing the prospect of improved infrastructure and the mineral potential of the district, Cranbrook BC based Eagle Plains Resources Ltd re-staked the Gayna River deposit during 2000. In 2004, Eagle Plains acquired five prospecting permits and staked several claim groups to secure mineral title to many of the Zn-Pb showings in the belt.

During July of 2005 Eagle Plains Resources supported field work for a multidisciplinary group of geologists to re-examine the major showings in the Zn Belt to reassess geological field relationships and to sample the mineralized settings. The goal of this work is to discover what

controlled the mineralizing systems and to use this knowledge to explore for extensions to the known deposits as well as to predict areas of high potential for new exploration. Work is continuing to correlate stratigraphic units and structures across multiple map sheets in the region, plus more age dating and research on ore fluid chemistry, alteration, mineral chemistry and paragenesis.

The presentation will briefly review the methodology employed in selecting the showings in the Zn Belt and give an overview of their location and geological features. Four major showings will be discussed in more detail. Several posters presented by members of the study team, reviewing the geology of the mineralized settings may be seen at the poster sessions.

The showings and properties of significant economic interest are the Gayna River, Bear, AB and Tic. All show significant sphalerite mineralization associated with dolomitic alteration within limestone and dolostones. All four showings have locally high grades of Zn mineralization associated with alteration and/or brecciation with Gayna River and Tic having the largest footprints. All the showings in the Zn Belt have been grouped into the MVT class but are now believed to be more closely affiliated with the Irish Deposit Class. Most showings have a strong vertical continuity and with lateral continuity restricted to favorably reactive rock units.

MIRAMAR HOPE BAY LTD. - DEVELOPMENT OF HOPE BAY PROJECT, NU

Sherlock, R.
Miramar Mining Corp., North Vancouver, BC

Work at Miramar Mining Corporation's 100% controlled Hope Bay project included 6 different initiatives: 1. Permitting of the Doris North project; 2. Definition and expansion drilling of the Naartok area; 3. Definition and expansion drilling in the Doris central area; 4. Surface exploration and diamond drilling on IOL exploration permits and Crown claims; 5. Regional exploration, including diamond drilling, on priority targets in the Madrid Corridor; and 6. Ongoing resource modeling of the Boston deposit.

1. In May, 2005 the Minister of Indian and Northern Affairs Canada (INAC) approved a Part 5 review of the Doris North Project under the Nunavut Land Claims Agreement. The Nunavut Impact Review Board (NIRB) held technical meetings August 23 - 25, 2005 to review the draft Environmental Impact Statement (EIS). These meetings provided interveners in the permitting process the opportunity to provide feedback to Miramar in preparation of the Final EIS, anticipated to be filed in late October.

2. Drilling at Naartok returned some spectacular results, such as drill hole 05PMD328 (11.5 g/t Au over 66.5 m at a depth of ~ 275 m below surface). Hole 05PMD328 was a 100 m step-out from a 2004 hole (04PMD274) that intercepted 9.8 g/t Au over 64.2 m. Currently the Naartok area is drilled off on 25 m spacing to a depth of ~ 200 m and at 50 m spacing to a depth of ~ 300 m below the surface. On-going work will produce a more robust resource estimate of this area.

3. Drilling at Doris Central encountered significant mineralization, including 54 g/t Au over 4.4 m. Program drill results helped to better define controls on mineralization and identified a shallow south-plunging core of higher grade mineralization. Drilling also extended mineralization outside the previous resource limits, particularly in the southern portion of the deposit. Most of the Doris Central deposit has now been drilled off at 25 m centres and resource limits are reasonably well established. Current work underway will produce a robust resource model.

4. Surface exploration was focused on the central half of the belt, mainly on IOL exploration permits, with the scope of the work dictated by assessment requirements. 1:10,000 scale mapping was conducted using our current understanding of the Doris, Madrid and Boston resource areas. The work focused on defining the structural framework, tracing panels of volcanic strata and identification of prospective units within the stratigraphic panels. On each of the four IOL exploration agreements, initial drill holes were completed targeting prospective areas.

5. The Madrid 11+-km long Corridor consists of regional-scale structures and prospective volcanic rocks. 2005 exploration along this corridor consisted of remapping prospects, in light of what is understood from the Naartok area, as well as limited drill testing of priority targets.

6. Field work at Boston was limited to relogging drill holes. Ongoing work includes resource modeling utilizing 2004 drilling and an improved understanding of the geology and distribution of mineralization.

CREATION OF A SEISMIC SHOT HOLE LOG GEODATABASE FOR THE NWT: APPLICATION AND BENEFITS FOR FUTURE RESOURCE DEVELOPMENT

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The Geological Survey of Canada (GSC) is creating a public geodatabase of seismic shot hole log records (aka driller's logs) from Northwest and Yukon territories. It is designed to provide near-surface (<20 m depth) surficial and bedrock geology data that will be of potential benefit to a wide variety of users and applications (e.g., seismic exploration, pipeline development, granular aggregate resources, environmental consulting, aboriginal groups and local communities). Proof of the benefit of regional analyses of shot hole log records comes from northeastern B.C., where the BC Ministry of Energy and Mines, in partnership with industry, were able to identify granular aggregate deposits buried below 1 – 4 m of till. Subsequent follow-up proved one of these sites to be a significant deposit, and it was mined. Similar applications could be conducted along the proposed Mackenzie Valley pipeline corridor.

In the early 1970's, in response to the original Mackenzie Valley pipeline proposal, Owen Hughes (GSC) orchestrated the transcription of shot hole log records held by petroleum companies onto individual card files. This data aided reconnaissance surficial geology investigations, but remained unwieldy and largely ignored due to its printed format and shear quantity (>40 000 cards). As a Mackenzie Valley pipeline is once again being considered, there is a clear need to make available all existing surficial and bedrock geology data. It was therefore decided that the card file shot hole records should be entered into an Access geodatabase, wherein they could be queried, allowing users to extract specific data of interest to be used in the creation of reports, or in a GIS to make maps. Examples of products presently being derived from the geodatabase include drift isopach maps, bedrock lithology maps, occurrences of granular aggregate at surface and at depth, flowing holes (artesian aquifers), buried ice, and gas. Potential also exists to use the geodatabase in 3-D analyses of surfaces (e.g., buried valleys, massive ground ice). The geodatabase presently contains 68 350 records from Northwest Territories (3000 in the Mackenzie Delta) and 11 650 records from Yukon Territory.
As a general rule the quality of individual shot hole log records is poor. However, when placed in a regional context, and when used in combination with other sub-surface data and surficial geology investigations, where geological understanding is more reliable, the overall quality of the information extracted is good.

It is anticipated that the first version of the shot hole log geodatabase will be made public in 2006. Hopefully industry, governments, and other organizations will recognize the importance of maintaining and updating this geodatabase and subsequent versions will be released. To this end, the NEB has agreed to include a memo with all future seismic permitting applications in the Northwest Territories that invites companies, on a strictly voluntary basis, to provide additional shot hole log records for inclusion in the geodatabase. Companies can also choose to make available archival shot hole log records.

3-D MODEL OF THE CENTRAL SLAVE CRATON

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Several methods of analysis have now been applied to over five years of earthquake-generated seismic waves recorded at 25 POLARIS teleseismic stations within the Slave craton. Results of these analyses were compared with results from previous studies, magnetotelluric surveys and analysis of xenoliths and xenocrysts from kimberlites to produce a low-resolution model of the mantle beneath the southern half of the Slave craton. The Moho is very flat and located at about 37 km depth, increasing gradually to 40 km in the east. The mantle of the southern Slave can be sub-divided into three areas. The area southeast of the north shore of MacKay Lake probably has the most typical properties and appears characterized by three seismically-defined mantle layers with boundaries at 120 and 200 km. To the north, the Lac de Gras area has an additional layer

and its boundaries dip southward, at almost 30° between Ekati and Diavik, at depths of 110-120, 150-160 and 190 km. The additional layer between 110-160 km is thought to be ultra-depleted and carbon-rich and has a distinct albeit weak rock fabric. A possible interpretation is that it was thrust under this area from the north or west, but complex layering due to differentiation caused by an underlying Archean plume remains possible. The northern part of this Lac de Gras area exhibits much greater directionality (stronger anisotropy) in the seismic waves and is attributed to a stockwork of kimberlite feeder dykes to the Lac de Gras kimberlite field. The area is also underlain to 400-450 km depths by anomalously (-2.8%) slow P-wavespeeds that can be attributed to higher temperatures (partial melt?) or unusual eclogitic compositions related to melt extraction. The western Slave exhibits little evidence of similar layering and the westernmost station at Gameti displays distinct seismic characteristics that may indicate that it overlies mantle subducted during the Proterozoic Wopmay orogen as hypothesized further south near Yellowknife. Lower P-wavespeeds throughout the western Slave mantle are similarly attributed to effects related to Proterozoic subduction.

SOUTH AND CENTRAL BAFFIN ISLAND DIGITAL GEOLOGICAL ATLAS: SYNOPSIS AND TECTONIC EVOLUTION MODEL.

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Geological Survey of Canada, Ottawa, ON

A digital geological atlas covering all of Baffin Island south of 70°N is currently being produced by the Geological Survey of Canada, with release date expected in early winter 2006. The compilation was created in ArcMap™ format and includes bedrock and surficial geology compilation from sources varying from 1:100K to 1:250K. Thematic layers include aeromagnetic and gravity gradient images, geochronology (U-Pb and ^{40}Ar-^{39}Ar), lithogeochemistry (major, traces, REEs), tracer isotopes (Oxygen, Sm-Nd), mineral occurrences and digital structural data where the latter were available. This digital database comes on the heels of two relatively recent multidisciplinary geoscience mapping projects that were centered on Meta Incognita Peninsula on Southern Baffin Island and on the Piling Group in Central Baffin, respectively. Both these projects, in addition to numerous new tracer isotope analyses performed on archival samples, have significantly added to our knowledge base with respect to protolith formation ages, crustal architecture and tectonic evolution. The maps and data provide a more concise picture of the tectonostratigraphic framework and allow a better definition of the extent of Archean basement beneath Proterozoic cover.

High-precision U-Pb TIMS and SHRIMP data suggest that initial rifting and deposition of cover sequences was more or less contemporaneous along the Superior and Rae craton margins during the interval 2.16 – 1.96 Ga. A third and separate Archean craton (Meta Incognita microcontinent) is identified between the Rae and Superior cratons, from which it is bound by the 'Baffin' and 'Soper River' sutures, respectively. A large gap underlain by lower crust yielding ca. 2.5 to 2.35 Ga Nd model ages has been identified west and southwest of Cumberland Sound, between the

Rae and Meta Incognita cratons. This model age range is similar to that obtained from the Sask Craton in the Western Trans-Hudson Orogen, adding to the body of evidence for earliest Paleoproterozoic crustal growth in Laurentia. At ca. 1.88 Ga, mafic and ultramafic dykes and sills were emplaced along the Superior craton margin (Chukotat gp.) and the extended Rae margin (Bravo fm. in the Piling gp.). However, despite the similar ages and settings, contrasts in their trace element geochemical signatures, in addition to tectonic reconstruction constraints, preclude a common origin. This would argue more in favor of a plate tectonic rather than plume origin for these penecontemporaneous intrusions. The widespread occurrence of monazite yielding ca 1.83 to 1.80 Ga ages, spanning uniformally from Cape Smith Belt to the Rae margin north of the Foxe Fold Belt, suggests that the entire southern half of Baffin Island was deformed or reactivated during the Trans-Hudson orogeny, from which it is an inclusive part.

EXPLORATION UPDATE: CHURCHILL DIAMOND PROJECT, NUNAVUT

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The 8.5-million acre Churchill Diamond Project contains the newly emerging Churchill kimberlite district that was discovered in 2003 and 2004 by Shear Minerals Ltd., Stornoway Diamond Corp. and BHP Billiton Diamonds Inc.

Geographically the Churchill Diamond Property is located between the communities of Rankin Inlet and Chesterfield Inlet in the Kivalliq region of Nunavut, where exploration is facilitated using barge and rail access. Geologically the project is located in the Churchill Geologic Province cratonic rocks and is underlain by the Archean Rankin Inlet group.

Past exploration in the region has been largely for gold and base metals, whereas systematic exploration for diamond bearing intrusives within the area has been limited to the last couple of years. Previous kimberlitic discoveries include narrow kimberlite dykes (192-214 Ma) intersected during drilling at the Meliadine gold deposit and the highly diamondiferous Parker Lake (Akluilak) dyke (1832 Ma) that is now believed to be associated with the magmatic event responsible for the Christopher Island Formation. More recently, exploration companies Cumberland and Comaplex announced the discovery of 11 new kimberlites in 2003, and the GSC reported numerous kimberlite float occurrences throughout the Meliadine trend. These occurrences suggest that multiple kimberlitic sources of differing ages exist in and around the Churchill Diamond Property. The Churchill kimberlites are being age dated at the University of Alberta (Heaman, Creaser & Hay) and have given phlogopite and perovskite age dates so far ranging from 173-223 Ma.

From 2003 through to 2005, Shear and its partners drilled 41 new kimberlites plus two kimberlite outcrops over a 60km by 60km area on the Churchill and Churchill West projects. In total, fifteen of the kimberlites have been diamond bearing; three of which produced macrodiamonds.

In 2005 KD209 produced the largest diamond measuring 0.9x0.88x0.64mm, one of 9 diamonds produced from 76.5 kg.

Throughout the property there is a full suite of indicator minerals including pyrope garnets, eclogitic garnets, chromites, ilmenites, chrome-diopsides and olivines. Interest lies with the pyrope garnets as approximately 27% are G10 subcalcic pyropes that plot to the left of the 85% line defined by Gurney (1984), implying derivation from within the diamond stability window. Across the property there is significant mixing of high interest (G10) and lower interest pyropes (G9). Higher pyrope indicator mineral counts occur in three well recognized corridors. Two priority corridors – the Josephine River and Sedna corridors – contain the most compelling G10 pyrope mineral chemistry. Within the tills of the main Josephine River Corridor, a distinct and well preserved cold geotherm (36mW/m2) indicates a large diamond stability window in the mantle beneath the core of the project area. The source to the high interest G10 garnets from the colder high interest geotherm remains unexplained; none of the kimberlites to date have recovered this specific G10 mineral chemistry.
In 2005 the joint venture partners completed a $5 million exploration program that tested 44 spatially separate geophysical targets with 52 drill holes after ground geophysics on over 125 grids. The drill targets were selected after careful integration and review of the Churchill Project data base which now contains more than 8,500 surface samples and 69,000 line km of magnetic and electromagnetic data. Exploration continues to target more specific source areas as more data is collected.

KILOMETRE-SCALE SHEATH FOLDS IN THE SLAVE CRATON

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In maps of the Archean Slave craton, elliptical areas of mafic volcanic rocks encompassed by sedimentary rocks are commonly interpreted to represent antiformal anticlines. Variation in plunge direction of fold axes, in some places attributed to subsequent refolding, can explain the apparent doubly plunging elliptical geometry. In a few locations, however, measured fold axes and associated linear fabrics maintain a consistent and subparallel attitude throughout the elliptical body. These examples of singly plunging anticlines have the geometry of flattened tubes, or "sheath folds," of mafic rocks protruding through siliciclastic hosts. Sheath folds are indicative of intense inhomogeneous non-coaxial deformation and are most commonly described from principal fault or mylonite zones.

Three areas of the Slave craton with kilometre-scale sheath folds are described. Each occupies a zone of demonstrated, or independently inferred, reverse faulting. 1) The recently recognized west-dipping Wailing-Banshee thrust corridor of the western Anialik volcanic belt hosts well-exposed sheath folds and extensive quartz veining at surface, yet their down-plunge extents are presently unconstrained. 2) The Boston area of the Hope Bay volcanic belt hosts a steeply south-plunging synformal anticline, with a widespread and pronounced linear fabric developed

subparallel to the fold axis. The Boston anticline can be interpreted to be the northern closure of a sheath fold, but its southern extent is poorly constrained due to extensive, and largely Proterozoic, faulting. Internal stratigraphic subdivisions of the central mafic sequence appear to close to both the north and south in an elliptical pattern, supporting a sheath fold geometry. 3) The Ormsby Break of the southern Slave craton hosts several mafic bodies along its length, including the Discovery, Ormsby, Morris Lake, and Goodwin Lake hornblende-bearing amphibolites that are largely enclosed by sub-andalusite-grade metaturbidites. A previous model invoking vertical "pop ups" of the steeply plunging amphibolites during strike-slip faulting is modified to include syn-metamorphic sheath folding.

Each of the discussed examples is characterized by auriferous quartz vein systems developed prior to the regional D3 deformation. Most interpretations invoke quartz emplacement as a progressive event during D2 that is broadly synchronous with the peak of regional metamorphism. Similar timing is inferred for development of the sheath folds. In some areas, significant gold accompanies the quartz emplacement, as demonstrated by past or on-going underground exploration and development at Discovery, Ormsby, Morris Lake, and Boston. On a broad scale, the quartz vein systems are developed in zones roughly parallel to the axes of the sheath folds; the down-plunge limits of auriferous veining remain unconstrained.

GEOCHROMATOGRAPHIC VECTORING OF BACTERIAL ORGANIC REMNANTS – PREDICTIVE GEOCHEMISTRY IN EXPLORATION FOR KIMBERLITES USING SOIL GAS HYDROCARBONS (SGH).

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Today, Soil Gas Hydrocarbons (SGH) brings a new facet to kimberlite exploration. With 162 organic compound results for each sample, 19 sub-classes are used to observe geochromatographic signatures and trends that vector to the location of buried kimberlite pipes.

A forensic pattern recognition approach has resulted in defining specific SGH signatures for various types of targets. SGH is a geochemical test that has successfully been used to delineate a wide variety of buried mineralization as shown in two major CAMIRO (Canadian Mineral Industry Research Organization) studies since 1997 and has been favorably received by independent project consultants. Traditional soil gas compounds in the C1 to C4 carbon series range have been studied in the past, however these compounds are also actively cycled by the biosphere, affecting both their abundance and their flux from natural systems. The alteration of C1 to C4 signals by the biosphere and the effect of barometric pressure and precipitation on gas flux reduce their use in delineating buried targets. Previous studies have noted that the soil gas developed from a thermogenic organic carbon source associated with mineralization has the potential to produce a wide variety of hydrocarbons. An alternative then to these light hydrocarbons, are relatively heavy hydrocarbon compounds. The 162 specific hydrocarbons targeted in the SGH test covers a broad range of chemical classes and molecular weights in the

heavier C5 through C17 carbon series range. Near surface soils or peat samples are used as a collector of heavier hydrocarbons that have migrated to the surface and are analyzed with the SGH method. These hydrocarbons have been shown to originate from bacteria that live in the environmental conditions around kimberlite pipes and other mineral targets. This analysis requires measurement in the low parts-per-trillion concentration range for these minute hydrocarbons of interest. The anomalous values of specific compounds that define a kimberlite signature are then mapped using the sample locations. In the presence of a buried kimberlite, specific compound class maps form geochromatographic patterns that can be compared and used to vector to the buried target.

SGH has developed into a definitive and robust method that has been successful at indicating the presence of buried kimberlite and other targets. This presentation will discuss some of the latest case studies with examples of the forensic DNA-like kimberlite signatures obtained with SGH.

THE ROAD TO REGULATORY SAFETY COMPLIANCE

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An Outline of New Legislation and Regulations for Mineral Exploration

This session will provide information about new Occupational Health and Safety Legislation and Regulations (OH&S) for mineral exploration in Canada. Learn to develop sound corporate policies, understand director's and their project management's responsibilities to site workers by establishing a solid health and safety strategy. The diversity of government safety requirements for each division of Federal, Provincial and Territorial policies and legislation, in Canada will be stressed.

Specific items such as a working system to assist project managers with an overview of Corporate Policy, Safety Programs, Site-Safety Assessment and the development of Site-Safety Procedures and Implementations will be discussed. The session will also review Filing Processes, specific Mandated Registration of Site- Managers, required levels of First Aid and the importance of the Personal Information Protection and Electronic Documents Act (PIPEDA). A list of Resource links of governmental bodies overseeing Occupational Health and Safety regulations will be available.

ICE MOVEMENTS AND GLACIAL TRANSPORT OF PALEOPROTEROZOIC ROCKS IN THE BOOTHIA MAINLAND (57A AND 57B)

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In the southern part of Boothia Mainland (sheet map 57A and 57B), ice flow history was documented in the 2005 field season as part of the GSC-CNGO integrated geoscience project. The nature of macroforms features (i.e. ice-moulded bedrock, crag-and-tails and drumlins) indicates that northeast movement prevailed for a large part of the last glaciation in most of the area. Most large scale features of rock hills are oriented in the same direction, due to the overall parallel trend of the rocks in the area. However, the erosion record of microforms, demonstrates the occurrence of an important northward movement prior to the establishement of this northeast-directed ice flow. As the area is located north of the Keewatin ice divide, the early,northward movement is interpreted to reflect an unrestricted ice movement emmanating from the ice divide. Later, the development of a calving bay in the Boothia Gulf pulled the ice flow lines gradually toward the northeast, and in some cases toward the east. Locally, especially in the southern part of the study area, ice flow returned to north at the end of lateglacial time.

The cumulative effects of these ice movements on the glacial transport is clearly demonstrated by the dispersion of the Chantrey Group Proterozoic supracrustal rocks and adjacent volcanic rocks. The northeast trend of the dispersal train indicates transport of Chantrey Group rocks for more than 100 km from their source. A distinct palimpest older northward dispersion train can be distinguished in the northern part of the main dispersion train.
The high proportion of marine-submerged land poses a potential problem to mineral exploration programs in this area. The abundance of ice-rafted debris , the wave washing of striae, and the parallel trend of the main ice flow directions and pre-existing tectonic grain are among the challenges facing exploration geologists using Quaternary geology as a mineral exploration tool.

NIRB DRAFT GUIDES AND INFORMATION REQUIREMENTS

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The Nunavut Impact Review Board (NIRB) has developed *Draft Guides* and *Draft Rules of Practice for Public Meetings and Hearings* within the context of Article 12.2.23 of the Nunavut Land Claims Agreement (NLCA). NIRB will discuss the content and development of these documents and how they can assist Proponents and Reviewers understand and work within the NIRB screening and review processes.

In addition, NIRB has developed *Draft Project Specific Information Requirements (PSIRs)* detailing the information required by NIRB from proponents about their project proposals before

entering the NIRB screening process. The intent of the PSIRs is to assist NIRB in screening project proposals as a whole, rather than screening the multiple authorizations associated with a project individually. NIRB will discuss the purpose and development of the PSIRs.

REMEDIATION OF CONTAMINATED SITES IN THE NWT: 10 YEAR PLAN AND ECONOMIC INTERESTS

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The Contaminants and Remediation Directorate (CARD) of Indian and Northern Affairs Canada (INAC) is responsible for minimizing health and safety and environmental risks associated with contaminated sites in the NWT and for developing and implementing remediation plans that meet the needs and concerns of INAC, its First Nations partners and all Northerners.

There are currently 32 known contaminated sites and 185 suspected contaminated sites within the NWT. CARD has prepared a 10 year plan to address the priority sites and assess suspected sites in a logical, staged manner that addresses immediate health, safety and environmental risks while providing training, economic opportunities and capacity building in the NWT.

CARD prioritizes the sites by risk and addresses the sites in a 10 step process under the Federal Contaminated Sites Action Plan (FCSAP). The steps begin with site identification and end with long-term monitoring; each step involves consultations with other parties. Each site presents unique challenges. In relation to the mining industry, one challenge is to balance the views of stakeholders on site remediation plans, particularly around removal of infrastructure or structures that may have a mine heritage value. Third party interest such as redevelopment post-remediation or concurrent economic development during remediation activities present both a significant challenge and a significant opportunity. Exploration and redevelopment could lead to set backs in remediation and/or lack of clear tenure in relation to reduction of site liabilities. It can also lead to opportunities to share logistics and knowledge about sites.

TYHEE DEVELOPMENT CORP'S YELLOWKNIFE GOLD PROJECT: 2005 UPDATE

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[1] Tyhee Development Corp, Vancouver, BC
[2] Tyhee NWT Corp., Vancouver, BC

Tyhee Development Corp invested $13 million in the permitting and the exploration and development of its wholly-owned Yellowknife Gold Project, 90 km north of Yellowknife in 2005. Development focused on the Ormsby Zone where 3 million tonnes of measured and indicated resources grading 8.91 gpt gold have been identified, representing 862,000 ounces of gold. One thousand metres of underground development provides access the Ormsby Zone to a depth of 100 metres below surface and expose five separate enechelon mineralized bodies. Additional mineralized bodies have been intersected in diamond drilling.

Gold mineralization is associated with long, broad vertical domains of pyrrhotite +/- garnet, +/- biotite +/- carbonate metasomatized hydrothermal breccias transecting mafic metavolcanic rocks within the Discovery Shear Zone. Subsequent emplacement of shallow-dipping domains of silicification and quartz veining contribute narrow, more discontinuous but very high-grade gold mineralization to the mineralized domains. Gold mineralization occurs over a 3 km strike-length and to depths of more than 700 m below surface. A prefeasibility study is being conducted to evaluate the economics of placing the Yellowknife Gold Project into production at a rate up to 1,500 tpd.

USING TOPOGRAPHIC LIDAR TO PREDICT COASTAL FLOOD EXTENT AND MAGNITUDE IN THE BEAUFORT-MACKENZIE REGION, NWT AND YUKON

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Storm-surge flooding along the Beaufort Sea coastline is caused by strong northwesterly winds during the open-water season of late summer and fall. The impact of these storms depends on the absence of pack ice creating large-open water fetches that enable the generation of large storm waves. Maximum storm-surge elevations for the area are close to 2.5 m or greater along much of the Beaufort Sea coastline. The Geological Survey of Canada is using recently acquired topographic LiDAR to map potential flooding extents due to storm surges and river floods in selected areas of the Mackenzie Delta region of the Northwest Territories and nearby parts of the Yukon coast. LiDAR enables the generation of high-resolution (decimetre level) digital elevation models (DEMs) and digital surface models (DSMs) that represent the local topography and associated geomorphic features. The areas of interest include the communities of Tuktoyaktuk and Aklavik, the seasonal community at Shingle Point, and less populated hydrocarbon exploration and development areas of the outer Mackenzie Delta. Accurate representation of

past, present and future storm-surge flooding levels in these areas is critical for community planning, engineering design, and land use and habitat management in the outer delta region. To obtain an accurate representation of coastal flooding, the relationship between the mean water level (MWL ≈ MSL) and land elevation (geodetic datum) needs to be known to high precision. Long-term sea-level and river stage records in the region are limited to Tuktoyaktuk (45 years) and several seasonal water-level gauges on the Mackenzie River delta distributary channels. Other than at Tuktoyaktuk, the relationship between water level and local vertical datum is poorly defined, particularly in the outer Mackenzie Delta. Geodetic surveys are being conducted to help alleviate this problem. Projections of flooding magnitude and extent derived from superimposing surge water levels on LiDAR DEMs are being validated using Synthetic Aperture Radar (SAR) imagery collected during a major storm-surge event in 2000, log line debris as represented on the LiDAR DSM and airphotos, real-time kinematic GPS field surveys, and local traditional knowledge. Validation of the models will enable flood-risk maps to be developed for each area for application to community planning, engineering design, and development of robust strategies for adaptation to climate change. With the potential for the intensity and severity of coastal flood hazards in this region to increase over the next century due to climate warming and land subsidence, resulting accelerated sea-level rise and reduced sea ice, it is important to develop a better understanding of flooding hazards under present conditions.

YOUR LAND, YOUR FUTURE: ENGAGING YOUTH IN RESOURCE DEVELOPMENT AND SUSTAINABILITY ISSUES

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At a time when the range and scale of northern resource development is extraordinary and the pace of change unprecedented, it is critical that youth understand current local events so that they can consider the potential impacts on their future.

The proposed Mackenzie Gas Project is the largest industrial development in the history of the North, and will bring about changes, both positive and negative. As such, the proposed Mackenzie Gas Project presents an excellent opportunity to create and launch a stimulating and engrossing educational resource for Northern youth which considers both the historical and current issues surrounding oil and gas development.

The Your Land, Your Future resource supplies the background information and tools to help youth understand media and community dialogue around the proposed project and review processes. By presenting the range of perspectives and fostering spirited discussion, the Your Land, Your Future resource aims to ignite a passion within youth so that they get involved.

At the core of the Your Land, Your Future Project is a CD-ROM package. This package presents a wide range of information and views in an easy-to-use and stimulating format, entirely computer-based. The resource will help youth engage in the review processes of this major

proposed development project. Included in the CD-ROM are teacher lesson plans to guide the teacher through classroom use of the package.

The perspectives presented on the CD-ROM come from the different stakeholders themselves, who have donated their time to contribute to this project. The package is rounded out with related sections on the Mackenzie Gas Project descriptions, the environmental assessment and land use planning processes, the NWT Protected Areas Strategy, the Berger Inquiry and the history of oil and gas development in the NWT. While the CD-ROM is intended for use in schools anyone wanting an overview of the project and the broad range of perspectives would enjoy this resource.

Northern Studies teachers from 16 communities from every region of the NWT have been trained on how to best use the CD ROM package in their classrooms and are currently using the resource. November 28-December 2nd students from participating classrooms will be attending a youth forum in Yellowknife where they will job shadow different stakeholders and participate in workshops. The final day of the forum will culminate in a facilitated discussion with specific questions regarding the Mackenzie Valley Pipeline where students will represent the broad range of stakeholders and have an opportunity to express their own opinions. By learning the views of others, students will broaden their understanding of the issues and become full participants in the future of the NWT.

EDGEO AND BEYOND: TEACHER AND COMMUNITY OUTREACH

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My role as a general Science educator and a geoscience specialists creates three main types of outreach opportunities: multi-district workshop focused on the needs of specific grade levels and organized under the auspices of the EdGeo Programme; topic focused workshops given to groups of teachers on structured Professional Development days within a specific district; and general workshops given through community groups and through the public library system on topics of specific interest. This presentation will briefly describe and compare the different types of outreach programme.

In EdGeo workshops, one or two educators work with a similar number of professional geologists for a whole day programme. Although the participating teachers pay a registration fee, much of the cost of the workshop is funded through the national EdGeo programme, a subsection of the Canadian Geoscience Educators Network (CGEN) which is supported by the larger geoscience community. The workshops are very curriculum focused with activities designed to help the teachers better understand geologic processes but also have them work through appropriate teaching strategies for that particular grade level. Through the support of EdGeo the participants leave with such materials as sets of rocks and fossils, posters, books and a resource package of background material and teaching ideas.

For Professional Day workshops within a district the sessions are usually one and a half hours long and focus on a single topic. They are generally a mixture of hands-on and information to facilitate a particular topic area and are designed for to cover a range of grade levels, but usually concentrating on the non-specialist grades. For example, I might do a workshop on Geologic Time that would be aimed at the current Science 7, Science 10 and Earth Science 11 teachers of that district.

In my community role I have been adapting some of the specific teacher focused presentations for a more general audience. At the same time I have developed a generic Geologic Hazards programme that I can adapt to specific audiences through the use of local content to illustrate various concepts. This programme considers such hazards as volcanic eruption, flooding, mass wasting, and earthquakes that are all possible hazards in the Fraser Valley of British Columbia. The use of archival photographs reinforces the historic and repetitive nature of these hazards.

AN APPROACH TO IDENTIFYING CORE REPRESENTATIVE AREAS WITHIN EACH ECOREGION OF THE NORTHWEST TERRITORIES, TO MEET GOAL 2 OF THE PROTECTED AREAS STRATEGY

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[2] World Wildlife Fund Canada, Yellowknife, NT

The Northwest Territories Protected Areas Strategy (NWT-PAS) has two goals: (1) to protect special natural and cultural areas, and (2) to protect core representative areas within each ecoregion of the NWT. To date, there has been considerable effort and progress on the first goal. However, more effort is needed on the second goal, as there are still large parts of the NWT where no special areas have been put forward for protection. The NWT-PAS Ecological Working Group is working on identifying potential core representative areas in parts of the lower Mackenzie Valley, where we currently have several under-represented ecoregions, as well as the best data. We are using two spatial data layers as surrogates for biodiversity: landscape units (biophysical land units defined by soil attributes), and vegetation (earth cover mapping done by Ducks Unlimited Canada). We are testing the following approach: (1) Use a combination of landscape units and earth cover to define a coarse filter for ecological representation; (2) Select coarse filter options for representative areas using a Marxan computer model; (3) Consider where the potential representative areas overlap with development interests and areas that communities have already identified as important; (4) Seek opportunities for consultation with communities, leadership, and other stakeholders; (5) Do fine filter work of area selection with communities and other stakeholders, using additional ecological data, development interests, and other values they feel are important; (6) Propose that core representative areas be used as ecological benchmarks and that long-term community monitoring programs be established. The desired outcome is that some core representative areas be moved to legislated protection via the

Protected Areas Strategy. The methodology, preliminary results, challenges, and next steps will be discussed.

A BROAD LOOK AT WHAT IS NEW IN AIRBORNE GEOPHYSICS

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The last five years in airborne geophysics has seen enormous number of new developments; new sensors, better performance of existing systems as well as serious experiments with new platforms; all in all representing more changes in the field than have occurred since the 1950s when airborne geophysics first emerged as a primary technology for minerals exploration.

The new platforms being used are the most spectacular aspect of the current scene. At one end of the scale, we see several companies now offering magnetic surveys using unmanned drone aircraft only a few meters in size and at the same time, De Beers has commissioned an airship to fly geophysical surveys in southern Africa, by far the largest geophysical survey aircraft used for minerals work.

In the category of new sensors, gravity has come into it's own in the last five years and now there are three companies offering gravity gradiometer surveys and several more offering services with a new generation of basic gravity instruments.

Of the pre-existing technology, the greatest change has been in EM and specifically helicopter time domain. From 2000 when there were basically no systems to now with six commercial technologies being offered, one more in proprietary use and several more under going development.

Commensurate with the burgeoning array of new systems, there has also been a revolution in how the data from airborne surveys is processing and displayed.

The available airborne geophysical technology is more and better than ever before. However, the challenge more than ever for the end user is to be able to sort through all the choices and get the most appropriate solution for their specific geological problem.

THE TLI KWI CHO KIMBERLITE-A GEOPHYSICAL CASE STUDY

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The diamondiferous Tli Kwi Cho kimberlite complex is located about 360 km NE of Yellowknife, NT, Canada in the Lac de Gras kimberlite cluster of the Archean Slave Craton. Tli Kwi Cho consists of paired geophysical anomalies, DO18 and DO27 identified in a late-1992 helicopter-borne magnetic and EM survey, and was first intersected by drilling in March 1993.

From the initial airborne survey, both DO18 and DO27 show coincident EM and magnetic anomalies. Subsequent to the initial 1992 survey, continued geophysical exploration included two other generations of helicopter-borne magnetic and EM surveys, as well as ground-based magnetic, HLEM, TEM, gravity and VLF surveys. Modeling was performed on the data; for the magnetic results, both 2.5D forward and 3D inverse models were calculated and 1D inversion was performed on the EM data. This work yielded insights into the nature of the kimberlites, and was very useful in helping to delineate the edges of the intrusive complex due to the presence of both non-magnetic and non-conductive kimberlite phases.

Since the initial work in the mid-1990s, three additional airborne surveys have been performed over the complex; a Falcon survey in 2000, an AeroTEM II survey in 2003 and a VTEM survey in 2004. The results of these more recent surveys will also be examined in light of additional information about the complex and as well, what such new technologies can add in terms of identifying and defining new kimberlite occurrences.

OPPORTUNITIES FOR DIVERSIFICATION OF THE MINERAL INDUSTRY IN THE NORTHWEST TERRITORIES OVER THE NEXT 20 YEARS

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A diversified economy is a key objective of governments. The Government of the Northwest Territories has been working toward this objective for a number of years. This will remain a challenge for years to come and until such time, the cornerstone of the NWT's economy will remain the non-renewable resources development sector.

Under such circumstance, a further diversification of the mineral industry in the NWT would be relevant because: (1) Currently, the mineral industry is dominated by a single commodity: diamond, (oil and gas are second to diamonds in terms of GDP contribution). (2) "A diamond is forever, but its resources/reserves are not". The NWT needs other commodities to carry on its resource development when diamonds are exhausted. In addition, the NWT needs more "pillars",

or more commodities to be developed at the same time, to support its economy. While it is still important to encourage the promising diamond mining and the secondary industries, it is prudent for the NWT to take advantage of the booming resource market to diversify its mineral industry in the NWT. (3) As different minerals are geographically located in different places, diversification will also create benefit for different communities in the north.

The opportunity to diversify NWT's mineral industry is evident. (1) NWT is blessed with a rich mineral base, with more than 10 commodities that can be or have the potential to be economically mined. (2) Many of the associated mineral projects are already in their advanced exploration or even mine construction stages. (3) The Fraser institute's Mining Survey shows that mining companies recognize NWT's rich mineral endowment, ranking NWT the 4th place out of 64 jurisdictions surveyed in the world. (4) As the world resource market is booming, some previously uneconomic deposits could become economic. (5) Both federal and territorial governments are committed to improve the infrastructure in the North.

In sum, now is the best time for GNWT to diversify its mineral industry.

POSTERS

A TALE OF TWO SURVEYS: OIL & GAS PROSPECTING WITH SURFACE GEOCHEMISTRY IN THE CANADIAN ARCTIC

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In light of $20-50MM wells and 3D seismic @ >$45,000/km2 Devon Canada has investigated cheaper alternative exploration technologies in the Canadian Arctic to assist our ongoing evaluations of Mackenzie Delta and Beaufort Sea Exploration Licenses. As there are extensive oil and gas seeps at surface throughout the BMB, one of the technologies investigated, and the topic of this poster, was surface geochemistry.

Devon's initial survey was with the GORE-SORBER technology in the area of the Tuk oilfield on the Tuktoyuktuk peninsula. The primary goals of this survey were to template several oil & gas accumulations in the area to see if there was significant geochemical signal at surface, differentiate Paleozoic, Cretaceous and Tertiary-aged pools on the basis of hydrocarbon type and to delineate the pool boundaries. Our evaluation of the technology was based on the numerous available wells and extensive newly-acquired 3D seismic in the survey area. A templating survey of 221 stations in a grid and traverse arrangement was acquired in 2001. In retrospect, failure to adequately define a "dry hole" endpoint and an inadequate number of stations for this ambitious test ultimately were its downfall. Although some issues were confirmed (e.g. geochemical signal through continuous permafrost), and there were several very encouraging indications from the results, the survey ultimately yielded inconclusive results.

Two years later in 2003 Devon ran additional templating surveys utilizing the MMI (Mobile Metal Ion) technology. MMI is relatively new to oil & gas exploration, being initially developed for mineral exploration in Australia. The new surveys were over the Parsons Lake gas field on the Tuk peninsula and the Unipkat oil & gas field on Richards Island. These were chosen as they are relatively simple structures with a single zone of hydrocarbons, are covered by extensive 3D seismic and numerous wells in each define the subsurface structure and hydrocarbon distribution. The initial Unipkat results were encouraging, matching the subsurface hydrocarbon distribution quite well. Follow-up surveys were undertaken in 2004 in this and other areas.

Overall Devon was successful in proving up surface geochemistry, with limitations, as a useful exploration tool for the Canadian Frontiers. The results and learnings from our complete Surface Geochemical evaluation program are presented.

GRANULITE-FACIES SUPRACRUSTAL ROCKS OF THE TSU LAKE AREA, NWT

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As part of the University of Alberta-NTGO field school, we have initiated a study of high-grade supracrustal rocks from the Tsu Lake area, NWT. The area is located within the Paleoproterozoic Talston Magmatic Zone, a granitoid terrain with abundant inliers of metamorphosed supracrustal rocks. The ultimate goal of the study is to evaluate the protoliths of the supracrustal rocks and, if possible, gain some insights regarding the tectonic setting that the supracrustals were deposited.

The supracrustal package contains four major lithologies, semi-pelites, pelites, quartzites and mafic to intermediate composition granulites. The package is strongly deformed, intruded by various phases of Taltson-age (ca. 1.95 Ga) granitoids, and metamorphosed to granulite-facies conditions as indicated by the widespread occurrence of opx in both semi-pelitic and mafic units.

The most abundant unit in the package comprises semi-pelites, which contain qtz-plag-bt-opx±crd±grt and may have had greywacke protoliths. Pelites contain grt-sill-qtz-kfs-crd-bt and were likely derived from a mudstone protolith. Quartzites contain >90% quartz but in a few places contain thin laminations of darker minerals. These darker layers consist of magnetite and minor zircon and may represent heavy mineral layers in the original sandstone protolith. The mafic to intermediate granulites contain plag±hbl±opx±cpx±qtz and likely had basaltic or andesitic composition, intrusive or extrusive protoliths.

Possible tectonic environments in which this package of supracrustal rocks were deposited, include (but are not limited to) continental rift or continental arc basins. Future studies will focus on the geochemistry of these rocks, in particular the geochemistry of the mafic rocks, as a guide to tectonic environment.

CLASSIFICATION EXPERIMENTS USING LANDSAT TM, RADARSAT-1 AND D.E.M. DATA FOR MAPPING SURFICIAL GEOLOGY ON NORTHERN BAFFIN ISLAND

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[2] Geological Survey of Canada, Ottawa, ON;
[3] Geological Survey of Canada, Calgary, AB

Remote predictive maps, developed by integrating and interpreting various types of remotely sensed data and produced in advance of fieldwork, have significant potential for increasing the effectiveness and efficiency of regional-scale geoscience studies. The Canada - Nunavut Geoscience Office, in collaboration with the Geological Survey of Canada, is conducting a multi-year project on northern Baffin Island with objectives of producing 1:100 000-scale surficial geology maps, regional ice movement, deglacial ice-sheet dynamics and chronology studies. Remote predictive techniques provide field geologists with information that assist in mapping and planning activities.

Supervised classification techniques were used to create selected predictive surficial geology maps of an area (NTS 37E) southeast of Pond Inlet, Nunavut. This process groups pixels of statistically similar digital numbers from a remotely sensed dataset (i.e., Landsat TM and RADARSAT) into classes based on signatures derived from training areas, which represent classes of surficial materials. Training areas were delineated by air photograph interpretation. Based on preliminary comparisons with training areas, the accuracy of the classifications using Landsat TM was approximately 91%. The accuracy of the results improved to 93% when RADARSAT data was also used in the classification.

Supervised classification results are strongly dependant on the quality of the training areas. Thus, tests must be conducted to verify their reliability. If successful, the remote predictive mapping techniques applied to this project area may also be useful in other regions where similar terrain and geology exist.

PROBING THE LITHOSPHERE OF THE SLAVE CRATON THROUGH SEISMIC SURFACE WAVE ANALYSIS

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Seismic surface waves have the characteristic of being dispersive – each different frequency travels at a different speed. This is mainly due to the fact that the longer the period of the wave, the deeper it samples the Earth. Rayleigh waves from distant earthquakes propagate in nearly vertical planes (like ocean waves at a beach). Studying them at periods between 20 and 180 seconds yield information about the vertical component of the S-wave velocity from 50 to 300

km depth. The setting of the POLARIS seismic experiment in the Northwest Territories renders different kinds of surface wave analysis possible for the lithosphere of the Slave craton, divided into three parts corresponding to the Central, South-East and South-West Slave. Here we use arrays of stations to produce average S-wave models for the region under each array. We obtain Earth models for the entire NWT Polaris array as well as Central, South-East and South-West Slave subarrays. These models can be compared with seismic velocities obtained from xenolith analysis. When the shape of the array and the azimuthal distribution of the seismic sources are good, the array analysis yields some insight in the azimuthal anisotropy of the underlying medium. Results for the Southeast Slave array are the most reliable and estimates obtained for the seismic anisotropy were compared with forward modelling and SKS splitting results. In the SW Slave only a few station pairs are currently available for reliable analysis, but distinct properties are indicated for paths between Yellowknife and Gameti, between Yellowknife and Indin Lake, and between Discovery Mine and Gameti. This is tentatively interpreted as indicating that Indin Lake lies above near-full thickness Slave craton mantle, whereas Gameti is located above the cratonic margin.

FIELD AND PETROGRAPHIC CHARACTERISTICS OF TWO ULTRAMAFIC PLUTONS IN THE SOUTHERN BEAR AND SLAVE STRUCTURAL PROVINCES, NWT.

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Two ultramafic plutons, the Labrish and Arm pyroxenites, occur within the southern Slave and Bear structural provinces. Plutons of this type are rare in these settings, but are significant as they provide a direct window into the mantle during the time of their emplacement and present possibilities for Ni-Cu-PGE mineralization. This study forms part of the South Wopmay Bedrock-mapping project by the NTGO and outlines each plutons character, including relative timing of the intrusions, based on field and preliminary petrographic observations.

The southernmost ultramafic pluton, the Labrish pyroxenite (LP), occurs 175 km northwest of Yellowknife, at Labrish Lake in the southwestern Archean Slave Province. The LP is preserved as a ~250 m wide steep-sided island within the lake, predominantly as pyroxenite-phlogopite sand derived from the direct erosion of the intrusion. Outcrops are sporadically preserved around the island and consist of medium- to coarse-grained pyroxene, phlogopite, and plagioclase. Some outcrops have late-stage cross-cutting pyroxenite-veinlets, serpentinization, alteration halos of phlogopite with local sulphidic pods and networks. Intrusive contacts of the LP are not observed, however adjacent host-rocks on the mainland are predominantly Neoarchean mudstone-greywacke turbidites with numerous cross-cutting granitic plutons (ca. 2600 – 2580 Ma). As the LP is not cross-cut by these granitic plutons, it is presumed to post-date them, implying a maximum of intrusion of ca. 2580 Ma.

The northern ultramafic pluton, the Arm pyroxenite (AP), occurs 225 km northwest of Yellowknife, at 'Arm' Lake, in the southern Proterozoic Bear Province (east of Wopmay Fault). The AP is a ~500 m wide, rounded mound and, as with the LP, is predominantly pyroxenite-phlogopite sand, resulting from direct weathering of the poorly preserved outcrop. The AP is mineralogically similar to the LP, consisting of pyroxene, phlogopite, and plagioclase, with minor sulphides (mostly pyrrhotite). Proximal to its boundaries, the AP is locally preserved as xenoliths and enclaves within surrounding quartz-poor granodiorite to tonalite (monzonite) that are themselves inferred to be Mesoproterozoic in age (see Jackson et al., this volume). This suggests that the AP is likely of comparable age. The observed commingling near its contacts also highlights that the AP may represent an early phase of a more mafic-intermediate melt that subsequently produced the surrounding granodiorite-tonalite.

Ten whole-rock and ten pyroxene-phlogopite sand samples were collected from each pluton for geochemical analyses, including whole-rock geochemistry and electron microprobe mineral chemistry. In concert with ongoing petrography, this study will: test the Ni-Cu-PGE prospectivity of the plutons; enable direct comparison of the LP and AP thereby helping to evaluate the emplacement processes and tectonic setting and; allow the mineral chemistry (e.g., clinopyroxene, ilmenite, phlogopite compositions) to be directly compared and contrasted with those from kimberlite and other ultramafic intrusions.

LANDSAT MOSAIC OF THE SVERDRUP BASIN, CANADIAN ARCTIC ARCHIPELAGO

Budkewitsch, P.[1], MacGregor, R.[2] and Gauthier, E.[2,3]
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[2] (on contract to NRCan) MIR Teledetection inc., Longueuil, QC
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There are two major basins represented in the Canadian Arctic Archipelago. The Sverdrup Basin covers a geographic range from south of Melville Island to northern Ellesmere Island. The majority of the basin is illustrated in this Landsat compilation, which grew out of a few independent initiatives to provide Earth observation data for supporting geological and environmental studies, providing a consistent and seamless digital geographic base and for making the data more accessible to the public in various formats.

The mosaic was constructed using several images from the Landsat-7 Enhanced Thematic Mapper (ETM+) sensor. The data were orthorectified to the best available consistent base for the entire area (i.e., 1:250,000), although in some areas 1:50,000 scale geographic control exists. Several of the images used were obtained from public domain sources, such as the Global Land Cover Facility at the University of Maryland (http://glcf.umiacs.umd.edu) and the set of Landsat-7 Orthorectified Imagery over Canada (L7 Ortho) available from Natural Resources Canada through GeoGratis (http://geogratis.cgdi.gc.ca). In order to create a mosaic of the Sverdrup basin with a consistent seasonal appearance, some additional Landsat-7 scenes not available from the

free data providers were purchased. In some cases, the extra scenes were necessary to fill in missing gaps or replace those exhibiting some cloud cover.

This digital Landsat product provides a regional compilation of Earth observation data for a significant part of Nunavut and northern limits of the Northwest Territories.

METAL UPTAKE IN PLANTS OVER KNOWN MINERAL SHOWINGS: TOWARDS AN EFFICIENT BIOGEOCHEMICAL EXPLORATION TOOL.

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Numerous geochemical methods have been used with varying degrees of success in regional exploration programs. All of these techniques are subject to standard problems found in a conventional sampling program, with the added variability of biological factors that may affect metal uptake and storage in the sample media. Biochemical exploration programs, utilizing helicopter-based, forest canopy sampling methodologies, have been proven cost-effective exploration tools in heavily treed areas. This study is intended as a pilot project to determine if an effective biogeochemical exploration technique can be identified for selected styles of mineralization in a sub-arctic boreal forest region.

Two polymetallic mineral occurrences near DeVries Lake (southern Bear Province), were investigated, the FXO (U+Mo+Ni) and the Nori (U+Cu+Mo) showings. One polymetallic, high-grade gold showing from the south Slave Province, the Crestaurum trenches (Au+Ag+As), was also studied. A sample site on DeVries Lake, lacking known mineralization serves as a control reference for the study.

A suite of samples was collected at each of the four sample sites including: Black Spruce (dead bark, trunk wood, mature cones, crown twigs, crown needles); Birch (bark, crown twigs); Labrador Tea (twigs and leaves); Alder (twigs); and humus. Dried samples were macerated and analyzed by acid dissolution followed by ICP-MS and ICP-ES; a second split of the sample was reduced to ash and analyzed in similar fashion. Analytical results show that most elements elevated in the host rock also exhibit anomalous concentrations in some of the tested plant tissues. Element concentrations are lower in the plant tissues than the host rock, soil or humus with the exception of silver in Black Spruce wood.

This study illustrates that Black Spruce, and other common plant species growing in a sub-arctic climate, accumulate selected elements when growing over mineral deposits. These anomalies are detectable, but subdued, in comparison to soil or humus samples. At the Nori (U+Cu+Mo) showing, Black Spruce trees yielded 0.16 ppm U and 0.92 ppm Mo in crown twigs, whereas the cospatial humus contained 34 ppm U and 87ppm Mo. At the FXO showing, humus concentrations of 6.65 ppm U, 3.32 ppm Ni, 64 ppm Ag were associated with concentrations of 0.090 ppm U, 2.00 ppm Ni, and 13 ppm Ag in Black Spruce crown twigs. Similarly, at the

Crestaurum trenches, 1085 ppm Au, 245 ppm Sb, 3439 ppm As and 464 ppm Ag in humus were significantly elevated relative to values of 6.8 ppm Au, 2.2 ppm Sb, 35 ppm As and 25 ppm Ag in Black Spruce crown twigs. These results were obtained using macerated vegetation; results using aliquots reduced to ash are comparable.

To be rigorously evaluated as an effective regional exploration tool, the technique should be tested on more dilute metal signatures expected in plants growing in glacial dispersion trains down-ice from the mineral showings. It is not clear from this study if the lower element concentrations in a glacial dispersion train will produce a detectable response in suitable species.

NAHANNI MINERAL AND ENERGY RESOURCE ASSESSMENT: TRENDS IN SPRING GEOCHEMISTRY

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Geochemical analysis of 70 spring waters were sampled within the 30,000km^2 region of the South Nahanni River basin (SNRB), Mackenzie Mountains, Northwest Territories, Canada, to assess the economic mineral potential of the remote region which is being considered for National Park designation.
Within the study area a broad range of springs are observed (thermal, acidic, saline, high pCO_2, and combinations thereof), and stable isotope data indicate that they are all meteoric in origin. The springs are classified into basic geochemical types, where each group can be associated with dominant rock types and processes of water/rock interaction. The major processes include sulfide oxidation, carbonate dissolution and contact-metamorphism near the plutons. Typical characteristics include: 1) metalliferous, low pH and high sulfate springs associated with shales and pyritic sandstones; 2) calcium carbonate dominated geochemistry, variable total dissolved solids (TDS), and only a few detectable trace elements in karst-dominated areas; and 3) hot or warm springs with variable flow rates, low TDS, high pH, sodium bicarbonate dominated, and including some high-pCO_2 springs in association with plutons. Importantly, pluton-associated springs have low concentrations of major ions but some are relatively elevated in dissolved trace elements, comparable to other regions of known base metal mineralization.

UNIQUE UPPER STRATIGRAPHY OF THE A154N KIMBERLITE

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The Diavik diamond mine is located approximately 300 km northeast of Yellowknife, NT. The mine consists of four project kimberlite pipes: A154 North, A154 South, A418 and A21. Of these, A154 North had a unique upper stratigraphy (now mined out). Approximately 60 metres of a sub-horizontally layered sequence of graded kimberlite was overlain by approximately 2 metres of mixed provenance epiclastics that were in turn covered by 1 to 2 metres of black muds. The epiclastics and black muds were only observed as a wedge on the eastern portion of the pipe. It appears therefore that the eastern portion (up ice side of the pipe) was partially protected during the last glacial advance.

The removal of glacial overburden revealed the 1 to 2 metre thick layer of dark black muds. These muds contained burnt wood fragments and kimberlite detritus. The mud layer was underlain by three distinct, poorly lithified, epiclastic units. These units were typified by varying proportions of detrital sub-rounded to rounded quartz grains, carbonate, kimberlitic minerals and burnt wood fragments. These epiclastic units had a combined thickness of approximately 2 metres. The quartz grains were most likely sourced from a pre existing quartzite, no longer present and believed to have been removed by glacial erosion. Although not common, quartzite xenoliths have been observed throughout both the A154 North and A154 South pipes. Pristine quartzite boulders were also collected from directly on top of the black muds located at the top of the A154N pipe.

The base of the detrital sequence was in contact with a thin, approximately 20 cm thick layer of fine-grained kimberlitic tuff or epiclastic kimberlite that did not contain quartz grains. The absence of quartz grains marked a change from a mixed source derivation, to kimberlitic source only. This thin layer of fine grained tuff was directly over the graded kimberlite sequence. The graded unit may represent a massive air fall deposit or a catastrophic slumping of crater rim material into an existing crater lake.

The top of the A154 North pipe provided an interesting look at the depositional history of a Slave Province kimberlite. It also provided evidence for a quartzite unit that is no longer present in the Lac de Gras area. While A154 North is unique when compared to the other Diavik project pipes, it exhibited stratigraphy that has similarities with those documented for the BHP Billiton Koala pipe (Nowicki et al, 2003).

REGIONAL TERRAIN HAZARDS AND LANDSLIDE MAPPING, MACKENZIE VALLEY: PROJECT DESCRIPTION AND PRELIMINARY RESULTS FROM THE 2005 FIELD CAMPAIGN AND MAPPING.

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In the last three decades, hundreds of landslides, often affecting areas of several hectares in size, have been identified and mapped in the Mackenzie Valley. A first landslide inventory was completed in 2000 in the western Mackenzie District and Yukon. However no detailed inventory has been compiled for the new proposed pipeline route between Norman Wells and Inuvik and more importantly no regional studies have been completed depicting the regional landslide hazards along this new proposed pipeline route. This paper presents the Natural Resources Canada's Mackenzie Valley Project component focusing on regional landslide hazards mapping. This initiative is intended i) to provide baseline knowledge on types, regional distribution, and control of landslides through a compilation of existing and new information; ii) to assess the potential impacts of hydrocarbon development on slope stability conditions and occurrence of landslides, and the influence of landslides on infrastructure and critical facilities; iii) to monitor zones of potentially unstable slopes along the pipeline route using remote sensing technologies; and iv) to assess the potential influence of environmental factors (e.g. climatic parameters, forest fires) and recent climate variability on frequency and magnitude of landslides.

This study area encompasses a corridor extending 20 km to either side of the proposed pipeline route between Inuvik and Tulita for a length of 540 km and an area of 24,000 km^2. The study area also includes the Rampart zone (southwest of Fort Good Hope) and the Thunder River region, both known for intense landsliding. The study area is covered by unconsolidated sediment deposits (99%), which are dominated by moraine deposits (60%). The study encompasses three zones of permafrost: intermediate, discontinuous, and continuous. The compilation of existing information and new data generated within this project were integrated into a GIS platform and into a global framework, which allows creating thematic maps and derived value-added products, such as landslide inventory and landslide susceptibility maps. At this stage, the GIS platform includes data on permafrost, bedrock and surficial geology, hydrology, elevation, administrative and political boundaries, climate, vegetation and forest fires, digital air photos, and satellite images.

Preliminary results from the first year of work are briefly presented. So far, over 1800 landslides and other natural terrain hazard features (e.g. karstic sink holes, rock glaciers) have been mapped in the study area. At present, about 40% of the study area has been mapped using 665 coloured air photos (scale of 1:30,000) acquired in 2004. For all the 1800 landslide entries in the database, the following parameters were recorded: landslide type and size, location, morphological parameters, surface tone and texture, vegetation re-growth in landslide scar, relative age, activity, material type, flight line, air photo number, and topographic map sheet. A collection of several hundreds photographs of landslides, taken while carrying out field campaigns completes the database.

Detailed investigations at eight landslide sites throughout the valley, as well as preliminary analyses from desktop landslide mapping are discussed. Preliminary results indicate an average density of one landslide per 5 km^2 and show that the dominant landslide types are retrogressive thaw flows (28%) and active layer detachments (26%) where rock falls (11%), debris flows (10%), earth slides (9%), and retrogressive thaw slides (5%) are second order of importance. About 47% of all landslides took place in moraine deposits. The relative age of landslides was estimated based on tone, texture, and vegetation re-growth parameters, where 38% were classified ancient (>50 years old), 40% intermediate in age (10-50 years old), and 22% recent (<10 years old).

NATIONAL GEOCHEMICAL RECONNAISSANCE: DRAINAGE GEOCHEMICAL SURVEYS IN NWT

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The National Geochemical Reconnaissance (NGR) program is Canada's geochemical drainage survey program. NGR consists of three main components: conducting regional geochemical drainage surveys; selective re-analysis of archived samples; and related orientation, methodology development, follow-up and interpretive studies. To date, over 80,000 streams and over 100,000 lakes have been sampled covering more than 2.6 million square kilometres of Canada's landmass. Originally undertaken primarily to assist mineral exploration, NGR data today have many applications. From mineral exploration, to mineral potential evaluation, to geological mapping, to environmental base-line data studies, these geochemical data have proven valuable far beyond the initial survey costs.

To date, five NGR lake sediment surveys and five NGR stream sediment surveys have been carried out in the Northwest Territories (NWT). The lake sediment surveys were conducted in the mid to late 1970's totalling 3,746 sites. The stream sediment surveys have been carried out since the late 1980's and contain sediment and water data for 3,010 sites. GSC Open Files 4670 and 4674 also contain additional heavy mineral concentrate/kimberlite indicator mineral data. In total, the ten surveys represent less than 10% of the NWT surface area.

In conjunction with the Northwest Territories Geoscience Office (NTGO), a new stream sediment and water survey was undertaken in the Sekwi Mountain/Macmillan Pass area during July 2004. The resulting data were published in September 2005 as GSC Open File 4949 and contains stream sediment and water data for 916 sites. These new data illustrate areas of anomalous base metal concentrations as well as areas of anomalous precious metal concentrations.

GEOLOGICAL ASSESSMENT OF KNOWN ZN-PB SHOWINGS, MACKENZIE MOUNTAINS, NORTHWEST TERRITORIES

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The Mackenzie Mountain Zn-Pb belt was actively explored in the 1970s with over 100 showings discovered, two of which have reported resources in the tens of millions of tonnes. Exploration ceased in the late 1970s owing to low commodity prices and the remoteness of the area. Interest in the Mackenzie Mountain Zn-Pb belt is undergoing a revival because of higher commodity prices and the prospect of improved infrastructure resulting from hydrocarbon exploration and development.

The objectives of the 2005 fieldwork were: 1) to visit and sample showings from a wide geographic area and stratigraphic range; 2) to compare the observed mineralization and alteration to that reported in the assessment files available from the NORMIN database (www.nwtgeoscience.ca/normin); 3) to rank the showings using exploration criteria such as stratigraphy, structure, carbonate alteration/dissolution textures, and ore textures; and 4) to sample for geochronology and geochemistry studies aimed at determining the number and timing of fluid events.

The showings at TIC, ART-EKWI, BEAR, ICE, KEG, RAIN, TAP, AB, DAB, GAYNA, PALM, TET-RAP, MAJESTY were visited and assessed. The locations described in NORMIN were found to be accurate, but the showing descriptions in the assessment files varied greatly in quality and completeness. Most of the visited showings are hosted in fractures, with minor brecciation, and very rarely, carbonate replacement. The main economic minerals are sphalerite and galena, but copper sulphides are commonly present. Gangue minerals include dolomite, calcite, quartz, barite and fluorite. The showings occur along structurally-controlled linear belts, but there is a secondary stratigraphic control as well.

The visited showings are categorized in NORMIN, and in the assessment files, as Mississippi Valley type (MVT) Zn-Pb showings, but the presence of common quartz, barite, and copper sulphides, along with fluid inclusions in the 165-200°C range make it unlikely that these are MVT deposits. The mineralogy, textures, limited fluid inclusion homogenization temperatures, and fluid inclusion chemistry indicate that Irish-style, polymetallic vein, SEDEX or intrusion-related deposit models are more appropriate. Mineralising events are known in the area from the Cambrian (Faro), Silurian (Howard's Pass), Devonian-Mississippian (Tom, Jason), and there are numerous Cretaceous intrusions in the area. Ongoing geochemical and geochronological work will help to correctly date and classify these showings.

Showings hosted in strata that were originally limestone (at the time of mineralization) rather than dolostone, that exhibit carbonate dissolution, and that have multiple generations of

sphalerite and galena are considered to be the best targets for further exploration. Based on this summer's field examination, the BEAR, GAYNA, AB, and TIC showings are considered the most attractive exploration targets.

DIAMONDS AND THEIR MINERAL INCLUSIONS FROM THE DIAVIK DIAMOND MINE, NORTHWEST TERRITORIES, CANADA

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Diamonds and their syngenetic mineral inclusions have been examined from the A154S pipe of the Diavik Mine, Lac de Gras, providing further information regarding diamond formation in the central Slave craton. Major and minor element compositions were determined for 157 inclusions, from 100 diamonds, using electron microbe techniques (EMPA). Studies on the host diamonds included the determination of the carbon isotopic composition ($\delta^{13}C$) and measurements of the nitrogen concentration and aggregation characteristics, using Fourier-transform infrared spectroscopy (FTIRS). Mineral inclusion data has shown that the A154S diamonds are largely derived from peridotitic sources (84%), with a minor (11%) eclogitic component and one diamond of undetermined paragenesis. Diamonds containing ferropericlase (4%) were present, with only one containing an additional phase, pyrite.

The most common inclusions were chromite (57) and olivine (52). Sulphide (15), Cr-pyrope (13), clinopyroxene (7), ferropericlase (7), eclogitic garnet (6), coesite (1) and diamond (1) were less abundant. The CaO content of the harzburgitic garnet inclusions was found to be >2.6 wt%, with an average of 4.4 wt%. The Mg number of olivine varied from 90.6 to 93.6, with an average of 92.7. Two diamonds were found to contain mildly majoritic harzburgitic garnets, determined by a small excess in silica over the available tetrahedral sites (6.12 cations Si at [O] = 24). The relatively high CaO content of the harzburgitic garnets and the comparatively low Mg numbers of the olivines indicate that diamond formation occurred in a moderately depleted environment, which is in agreement with that observed for the nearby Snap Lake (Pokhilenko et al., 2004) and Panda (Stachel et al., 2003 and Tappert et al., 2005) kimberlites. Calculated temperatures from non-touching inclusion pairs from individual diamonds range from 1180 to 1377 °C (average = 1282 °C), and are believed to represent temperatures at the time of diamond formation.

The carbon isotopic values ($\delta^{13}C$) of the A154S diamonds range from -10.5‰ to +0.7‰. However, when a few outliers are removed, a narrow distribution with 94% of diamonds between -6.3‰ and -4.0‰ becomes apparent. The nitrogen concentration of the diamonds varies greatly from below detection (<10 ppm) to 3833 ppm. The nitrogen aggregation covers the entire spectrum from poorly aggregated (Type IaA) to fully aggregated (Type IaB). Excluding all diamonds that show evidence of plastic deformation (i.e. brown body colour and/or plastic deformation lines), the remaining population (with only seven exceptions) has less than

25% of the nitrogen aggregated in B-centres. The paragenetic distribution, mineral inclusion chemistry, nitrogen concentration and aggregation of the A154S pipe is very similar to that observed for the nearby Panda pipe. If the 3.4 Ga Re-Os isochron age for diamond formation at Panda (Westerlund et al., 2003b) holds true for Diavik, the low aggregation states of the undeformed diamonds at A154S may indicate that residence in the mantle occurred at fairly low temperatures (<1100°C). Based on the temperatures determined from the non-touching inclusion pairs, the required temperature decrease, implied by the nitrogen aggregation characteristics, would have had to occur shortly after diamond formation.

QUATERNARY GEOLOGY AND GLACIAL LIMITS OF THE SOUTHERN MACKENZIE MOUNTAINS AND FOOTHILLS

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The Mackenzie Mountains north of 64^{o} have excellent geomorphic and stratigraphic records of pre-Late Pleistocene glacial conditions. In contrast, the southern Mackenzie Mountains preserve a Late Pleistocene record only. This record provides evidence that the southern Northwest Territories were glaciated by ice masses with source areas the Mackenzie Mountains and eastern Plains. Stratigraphic and geomorphologic evidence indicate that they developed at different times during the Late Pleistocene. The eastern continental ice sheet (Laurentide) advanced over the foothills and up valleys before mountain valley glaciers and Cordilleran Ice Sheet reached their maxima. As the continental ice sheet moved into the region, lobes sculpted the topography from the foothills to the mountains. The montane glacier suite included valley glaciers from the continental divide, local ice caps and the Cordilleran Ice Sheet in the southwest. This pattern of glaciation is similar to the style affecting the central and northern Mackenzie Mountains. The presence of montane and continental ice masses caused major landscape changes in the region. The Laurentide Ice Sheet advanced into the mountains and blocking drainage of east flowing rivers *ca*. 30 ka. Glaciers blocked the South Nahanni River in the vicinity of Virginia Falls and lower Flat River, resulting in the formation of a 6000 km^2 proglacial lake. For much of its duration, the lake drained southwest into Yukon Territory and the Pacific Ocean. East of Virginia Falls, the thickness of glacial lake sediments reaches 120 metres. Glaciolacustrine sedimentation was periodically interrupted by westward and northward continental glaciation that resulted in deposition of Laurentide tills. Granite boulders from the Canadian Shield were found over 100 km west of the mountain front. During retreat of continental ice and advance of montane ice (*ca*. 22 ka), Glacial Lake Nahanni cut an outlet joining a north-flowing meltwater channel system that reached the Arctic Ocean. Multiple tills deposited by montane glaciers in the upper North Nahanni River valley are overlain by outwash deposited after 22 ka. Another major geomorphic change that began at this time was the damming of Redstone River and deflection of the easterly flowing river northward across folded and faulted terrain. Postglacial incision triggered landslides (>25 x 10^6 m^3) in the Redstone River, many of which are still active. Elsewhere, major canyons (now abandoned) indicate that continental ice blocked drainage in the mountains, creating a meltwater channel system that drained northward across local divides west of the ice

front. The final phase of deglaciation (between 12 and 10 ka) resulted in deposition of a mantle of glaciolacustrine and deltaic sediments related to Glacial Lake Mackenzie. The last major channel to form was Mackenzie River, ca. 9 ka. Deformed Late Pleistocene glacial and postglacial deposits, landslides and offset faults like Virginia Falls suggest Holocene tectonic activity was an important geomorphic agent shaping the modern landscape.

DISTRIBUTION AND NATURE OF DIABASE DYKES, TSU LAKE, N.W.T.

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Diabase and gabbro dykes in the Tsu Lake area can be subdivided into three main subsets based on orientation. Dykes from the dominant subset trend 130°, vary in width from 0.5-45 m and occur mainly in the north and northeast portions of the lake. These dykes are typically dark grey to black in colour, fine to coarse grained (depending on width) with well-developed chilled margins. The coarser grained dykes consist of fresh plagioclase and clinopyroxene with a well-developed ophitic texture. Some of these dykes contain abundant country rock xenoliths (up to 12 cm in length) that are typically concentrated along discrete zones parallel to the dyke trend. The wider dykes can contain amygdules filled with quartz and calcite and mineralogical layering was observed locally. A few smaller (<2-m-wide) dykes from this subset are anastomosing and their trend can vary by 20°. Some of the 130° dykes have faulted margins. One interesting 130° dyke located along the Taltson River inlet displays magma mingling textures with the melted country rock syenogranite.

The second dyke subset consists of relatively fine-grained, narrow (0.5-m-wide) basaltic dykes with an orientation 010°. These dykes display sharp contacts and are commonly fractured throughout. The 010° dykes are located on the west side of the lake near the Taltson River outlet.

The third subset consists of a single, 030°-trending, >120-m-wide gabbro dyke located in the northwestern-most corner of Tsu Lake. This dyke is coarse-grained and consists of fresh plagioclase and clinopyroxene. Locally the pyroxene is altered to amphibole. Other features noted locally are weak mineralogical layering and partially digested country rock xenoliths. In addition, there are several narrow (<0.5-m-wide) cross-cutting and associated dykes of gabbro pegmatite, granodiorite and biotite granite.

In addition to a dyke distribution map (1:30,000), samples from each dyke subset will be investigated using an integrated approach involving petrography, geochemistry and U-Pb geochronology.

THE METALLOGENY OF THE NAHANNI WATERSHED: A MERA UPDATE

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The MERA study area, which includes the Nahanni watershed and a small portion of the Nahanni Karst, encloses an area of nearly 40,000 km^2 in the Mackenzie Mountains, NWT and contains a great variety of mineral deposits. Based on genetic models, these deposits have been classified into four main types, with variability introduced by distance from source and the nature of the host lithology.

Sediment-hosted deposits are preserved in widespread black shale units including the mid-Ordovician to late Silurian Duo Lake Formation, Road River Group and the lower to mid-Devonian Portrait Lake Formation, Earn Group. The former, hosts the Howard's Pass stratiform Zn-Pb deposits and the latter, the Macmillan Pass and Vulcan Zn-Pb $\pm$ Ba deposits. Past exploration efforts have identified concentrations of mineralization in small depositional sub-basins, but based on consistent and widespread nature of the mineralized stratigraphy, current exploration is testing a single widespread basin model for Howard's Pass region. Due to poor exposure, much of the southern Nahanni watershed remains under-explored for this deposit type, despite extensive distribution of favourable lithologies.
Intrusion-related deposits, such as the world-class Cantung E-Zone tungsten skarn, are the only deposit type currently being mined in the Nahanni watershed. For this deposit type, fluids derived from fractionating late Cretaceous plutons mobilized a suite of metals including tungsten, copper, bismuth, gold, arsenic, lead and zinc. The metal tenor of a deposit site was controlled by fluid temperature, often a factor of distance between the source pluton and a favourable calcareous lithology. Regional metal zonation can be recognized with proximal tungsten deposits and more distal deposits dominated by base metals. Gold-arsenopyrite quartz veins may represent intermediate members. Limestone of the Sekwi and Rabbitkettle formations is the most common host-lithology for intrusion-related deposits but other calcareous horizons may also be prospective.

Fault-controlled Zn-Pb-Ag veins and stratabound Zn-Pb-Ag massive sulphide deposits are represented at Prairie Creek. The quartz-carbonate veins containing sphalerite, galena, chalcopyrite and tennantite-tetrahedrite are hosted in dialatent fractures parallel to regional-scale normal faults crosscutting a variety of sedimentary rocks. The structurally competent and calcareous portion of the Whittaker Formation is the favoured mineralization site but high-grade vein segments may also be found in the clastic Cadillac Formation and the shaley Road River Group. The stratabound massive sulphides containing pyrite, sphalerite and galena occur within dolostone units of the Whittaker Formation. The relationship between vein and stratabound mineralization is the subject of ongoing research.

Placer deposits are small and have only had minor commercial development. Gold nuggets tend to be thin flakes .25 to .5 mm across that are problematic for panning and gravity separation

techniques to capture. The source of the gold is unknown but Carlin-style fine-grained disseminated gold in impure carbonate is suspected. The identification of felsic aplitic intrusions cut by copper-bearing quartz stockworks in the Sekwi Formation dolomites with anomalous gold concentrations support a local derivation model for the placer deposits.

A COMPLETE ORTHO-RECTIFIED LANDSAT-7 MOSAIC OF BAFFIN ISLAND, NUNAVUT

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Baffin Island is the fifth largest island in the world (excluding continental masses) with a land area of over 500,000 km² and lies entirely within the Nunavut Territory. To provide at once thematic terrain-based knowledge tied to an accurate (better than 1:50,000 scale) and seamless geographic base, a complete Landsat-7 mosaic from 66 scenes was created under the Northern Resources Program with the support of the Nunavut Geoscience Office. The technique employed is based on a single resampling procedure from acquired values in the original data array to the final pixel location in geographic coordinates, minimising planimetric error and preserving the radiometric integrity.

This digital panchromatic (15 m) and multispectral (30 m) product provides a regional compilation for a significant part of Nunavut and contributes supporting data for mineral and energy exploration efforts made by the private sector.

METALLOGENY OF THE SOUTH CENTRAL WOPMAY OROGEN

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The southern part of the Proterozoic Wopmay orogen has seen little recent mineral exploration. One exception is exploration by Fortune Minerals of the Cu-Co-Bi-Ag-Au-bearing, Fe-oxide-cemented breccias at Lou and Dianne lakes, west of the Wopmay fault zone (WFZ) in the Great Bear Magmatic Zone (GBMZ). This work updates the metallogeny of the SE Wopmay orogen east of the WFZ, as well as in part of the GBMZ recently mapped by Jackson et al. (this volume).

A variety of showings occur east of the WFZ, including Snare Group-hosted, sulphidic gossanous zones several km long with anomalous Cu at Ingray Lake; secondary chalcopyrite in magnetite-rich beds in separate wacke-argillite sequences around Grizzly and Crapeau lakes; and uraniferous quartz-hematite hydrothermal breccias associated with late NE- and NW-trending conjugate faults in granitoid intrusions of the GBMZ (e.g., Rayrock Mine). Carbonate- and fluorite-bearing veins, associated with these breccias, are part of a regionally extensive mineralizing event, having analogues that are widespread in both the Wopmay Orogen and the East Arm graben (Great Slave Lake).

The sequence of mineralising events observed at two showings from the South Wopmay Bedrock-Mapping Project area, and which have been the focus of detailed studies, are discussed below.

The Norris Lake Au-Ag-Pb-Zn-Cu showing, near the western limit of the Slave craton, occurs in a folded sequence of Snare Group graphitic slate, siltstone, and dolomite. An early assemblage of bedding-conformable pyrrhotite layers is associated with anomalous gold. This was followed by the injection of at least one phase of quartz-Fe carbonate veins containing pyrrhotite-sphalerite-arsenopyrite-galena with minor chalcopyrite, pyrite and gold. Gold in these veins (up to 18.1 g/t in grab samples) is commonly associated with arsenopyrite, and occurs rarely as visible gold. The veins, associated with a zoned mica alteration halo, predate the main deformation and metamorphism of the Snare Group, and are folded into isoclinal, east verging, moderately north plunging folds. Mineralized sulphide pods are preserved within minor S and Z folds. Late, barren quartz-Fe carbonate veins transect the foliation, and a late crenulation plunges steeply west.

West of the WFZ, at DeVries Lake, sedimentary rocks of the Treasure Lake Group form an inlier within felsic plutons of the GBMZ. The Cu-U-Mo-bearing NORI/RA is the most significant mineral showing. It occurs in a sequence of magnetite-bearing siltstone to argillite with localized conformable lenses, up to 25 cm thick, of tourmaline, hornblende, biotite and minor magnetite and uraninite (up to 0.42% U over 1m). The sequence was folded into tight, southeast verging, gently north-northeast-plunging folds. Brittle deformation of the competent tourmaline-rich zones was accompanied by aplite injection into minor fold noses, which forms stockworks and causes biotite alteration of the host siltstone. Both the aplite and associated tourmaline-rich zones contain disseminated molybdenite (up to 1.44% Mo over 1m), chalcopyrite, and pyrite.

Alteration styles observed in the DeVries Lake area include sodic, potassic, magnetite, amphibole, epidote, and silica alteration similar to alteration documented in iron-oxide-copper-gold (IOCG) deposits.

LANDSLIDES OF THE SOUTHERN MACKENZIE VALLEY REGION, NORTHWEST TERRITORIES

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As part of the Northern Energy Development Mackenzie Valley Project, the Geological Survey of Canada is presently working to improve our understanding of regional geological processes in the Northwest Territories. During the 2005 field season, surficial deposits and landslides were described and mapped in three physiographic regions: 1) mountainous areas with exposed bedrock, high relief and steep slopes; 2) drift covered lowlands with little relief; and 3) broad, deeply incised river valleys draining to the Mackenzie River. Geoscience data collected includes the spatial distribution of surficial deposits and landforms, classification, dimensions, physiographic setting and age of landslide event(s). In the Mackenzie Mountains, landslides predominantly involve carbonate-rich shale and weakly cemented sandstone and siltstone where gravitational spreading triggered by tectonic activity leads to catastrophic rock falls. Bedrock slopes exceeding 28% and 30 m in height are potentially unstable. Fewer bedrock-hosted landslides occur in the Mackenzie Lowland and Mackenzie Valley. If unfrozen and saturated, shale beds can move as active layer detachments, debris flows or debris slides. Limestone, dolomite, sandstone and quartzite fail as topples, controlled by intersecting bedding and joint planes; as rotational slides on underlying weak shale beds; or as translational failures along bedding planes. Most landslides in lowlands and valleys occur in glacial lake sediments and fine-grained, ice-rich till. Because of the low shear strength of water-saturated sediments, thawing of ice-rich fine-grained sediments on gentle slopes (5-27%) usually gives rise to active layer detachments and retrogressive thaw flows. Rapid debris flows in fine-grained glacial deposits occur in areas with high relief or where saturated sand deposits occur. Along steep riverbanks, frozen gravel and sand can move as blocks in rotational and translational slides, with failure occurring along planes developed in underlying weak, unfrozen glaciolacustrine clay and silt. Where the height of riverbanks and thickness of coarse-grained sediment is greater than the depth of permafrost, groundwater flow below the permafrost and above underlying impermeable deposits gives rise to artesian flow conditions. Retrogressive thaw flows and debris flows may develop if river erosion removes frozen, ice-cemented colluvium at the base of slope. Thermokarst subsidence in valley floors underlain by outwash and lake deposits also triggers translational debris slides. To summarize, most landslides are related to the degradation of permafrost or ground ice and groundwater movement through permafrost; and are triggered by stream incision, taiga fires, climate change and land use practices. Vulnerable sites include ice-rich, fine-grained sediments on slopes near water bodies; in areas affected by fire; and in frozen coarse-grained sediment overlain by clay-rich till exposed in steep riverbanks where permafrost does not extend to section bases. An increase in mass-wasting can be expected if climate change triggers changes in the amount and timing of regional precipitation, snow-melt and sediment supply to streams, and as rivers adjust their gradients to accommodate changing flow levels and sediment loads.

QUATERNARY LANDSCAPES OF THE SOUTHERN MACKENZIE MOUNTAINS, NWT

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We are currently examining the surficial geology of the Root River and North Nahanni River watersheds to improve our understanding of the limits to glaciation, subglacial processes, meltwater drainage patterns and glacial lake history in the southern Mackenzie Mountains. Field observations and mapping of stereo-pair air photographs at the "Mammoth Valley" site (62^{o} 34'N; 125^{o} 20'W) provide a benchmark of surficial deposits and geomorphology for the study area. Interpretation of lithofacies logs, annotated field photos, schematic cross-sections and a surficial geology map establish the geomorphic and chronostratigraphic relationships of various terrain units. Mammoth Valley has a modified V-shaped form suggesting an inherited pre-glacial (Tertiary) morphology and minimal modification during Quaternary glaciations. Remnant fragments of carbonate-cemented coarse-grained alluvial, lake and colluvial deposits preserved along the valley floor are interpreted as an early Quaternary (or Pliocene) ice-proximal valley fill sequence. These deposits indicate that tectonic uplift and montane glaciers periodically altered drainage and influenced erosion and sedimentation rates in the mountains prior to the last Quaternary (Late Wisconsinan) glaciation (ca. >30-10 ka). Cemented valley fill is extensively eroded and locally overlain by unconsolidated matrix-supported diamictons containing locally derived debris interpreted as montane till. The distribution of till indicates montane glaciers locally inundated Mammoth Valley during glaciation, and that it lay beyond the limit of the Late Wisconsinan Laurentide Ice Sheet. Terraced ice-contact kame-deltas overlie tills and older valley fill. These features were likely deposited in a proglacial lake dammed by glaciers, outwash and landslides in the Root River watershed to the east of Mammoth Valley. High terraces (graded between 1080 m and 1070 m elevation) may represent the limit to proglacial lake formation ca. 30-22 ka. Upper terraces were incised to a depth of 20 m during an interval of ice retreat and lake drainage after 22 ka. Lower kame-deltas are graded to a stable lake plane of 1060 m tentatively assigned to ages between 22 ka to 13 ka based on stratigraphic relationships. The retreat of montane glaciers between 13 ka and 10 ka was accompanied by intervals of lake drainage and incision of glacial and older deposits. During the final episode of lake drawdown, valley fill was incised to a depth of 25 m, triggering the erosion and rotational sliding of pre-glacial and ice-proximal deposits. Following drainage and incision, ice-distal (paraglacial) outwash, loess and colluvium aggraded the valley floor to an elevation of 1050 m. Incision of deglacial valley fill to a depth of 5 m is attributed to regional tectonic uplift over the last 10 ka. Modern, active channels graded between 1045 m and 1040 m, are underfit, with streams occupying a small portion of the relict late-glacial braidplain.

EARTHQUAKES AND SEISMIC HAZARD IN THE YUKON-BEAUFORT-MACKENZIE

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The prospect of new hydrocarbon production as well as gas pipelines from the Beaufort-Mackenzie region, and from Alaska has resulted in increased attention to the substantial earthquake hazard in the Yukon and westernmost Northwest Territories. Here, we describe the distribution of past earthquakes and the hazard estimates based on the earthquake data file of the Geological Survey of Canada, and geophysical and geological constraints. There is exceptional seismicity in the S.W. Yukon where the Yakutat terrane is colliding with the Pacific continental margin in the Gulf of Alaska. The collision is pushing up the spectacular St. Elias Mountains including Mt. Logan, Canada's highest mountain. The region has one of the greatest seismic hazards in Canada, with numerous recorded magnitude 7 to 8 earthquakes. Less well appreciated is the strong seismicity in the Mackenzie Mountains, Richardson Mountains, and the Beaufort Sea regions, with a number of magnitude 6 to 7 recorded earthquakes. The earthquake record and new high-precision GPS deformation data support a tectonic model of margin terrane collision driving the whole northern Cordillera Yukon block to the north-northeast at about 5 mm/yr. This motion is accommodated at the Cordillera eastern mountain front by overthrusting of the strong craton, as expressed by mainly thrust earthquakes in the Mackenzie Mountains. The northerly motion also produces frequent strike-slip earthquakes in the Richardson Mountains region, and perhaps the concentration of seismicity in the Beaufort Sea. Although there have been no historical large events under the Mackenzie Delta, there is a possibility that the Delta thrust front is capable of infrequent but large earthquakes. The very wide spacing of seismograph stations in northwestern Canada limits the epicentre accuracies, and correlation of the seismicity with geologically mapped faults is possible only for a few of the larger structures. Even recently, only earthquakes of magnitude above about M3 have been consistently recorded and depth determination has been possible for only a few of the larger recent events; they generally are in the upper crust. With the available earthquake catalogue and other information, hazard maps of ground shaking probability are as yet only very regional.

SOUTH WOPMAY BEDROCK MAPPING PROJECT AND INTEGRATED STUDIES: PRELIMINARY RESULTS FROM 2005, THE SECOND FIELD SEASON

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See Talks

CURRENT ACTIVITIES OF THE CANADA - NUNAVUT GEOSCIENCE OFFICE.

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The Canada – Nunavut Geoscience Office (CNGO) is a partnership between the Geological Survey of Canada (GSC), the Department of Indian Affairs and Northern Development, and the Government of Nunavut (Department of Economic Development and Transportation). The mandate of the CNGO is to provide accessible geoscience information and expertise in Nunavut to support sustainable development of mineral and energy resources, geoscience education, training, and capacity building. In 2005, the CNGO supported and participated in three, field-based geoscience projects, provided GIS, cartographic and Remote Predictive Mapping (RPM) support and services, and initiated outreach activities.

The North Baffin Project is an integrated geoscience project focused mainly on regional-scale surficial mapping and sampling, but also having a component of detailed bedrock mapping. The study area occurs in the northeast Rae domain, a region having exploration potential for diamonds, base and precious metals. The surficial mapping and related chronological studies will help to develop an ice-flow and chronology model that will have significant implications for regional drift prospecting programs in the North Baffin region.

The GSC-CNGO Boothia Project involved regional-scale bedrock and surficial mapping in a part of the western Rae domain having significant potential for diamond and precious metal exploration. The mapping followed a regional aeromagnetic survey completed in April 2005 (Geological Survey of Canada, Open Files 4897 to 4907). The bedrock mapping, interpretation of ice-flow direction and distance of glacial transport will be immediately valuable to mineral exploration companies working in the region.

A supply of high quality, affordable and environmentally sound granular aggregate is vital for developing municipal infrastructure. In 2005, the CNGO conducted a granular aggregate resource assessment for the City of Iqaluit. The study, initiated because of diminishing aggregate resources and environmental concerns at an existing site, identified a significant new resource of aggregate within municipal boundaries.

The CNGO continues to work with territorial and federal geoscience partners in promoting geoscience education, and an awareness of the importance of sustainable development of mineral and energy resources to the emerging Nunavut economy. In 2005, CNGO staff made presentations to community groups, schools, supported a visiting artist program, participated in an Inuit traditional place names project, and assisted Nunavummiut high-school teachers attend a summer geoscience education program.

DEVELOPMENT OF AN OVERBURDEN THICKNESS MODEL AS AN AID TO DRIFT PROSPECTING: AN EXAMPLE FROM LAC DE GRAS AND AYLMER LAKE.

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Thick overburden cover may hamper detection of kimberlite pipes and mineral deposits due to a lack of indicator minerals and geochemical signatures in till. To assist drift prospecting methods such as hyperspectral surveys, till geochemistry and other geophysical techniques in areas with variable overburden thickness (up to 42 m), an overburden thickness model for the Slave Province is being developed as part of the Geological Survey of Canada's Remote Predictive Mapping project. The modeling process is based on the construction of a bedrock elevation database established from diamond drill-hole data, as well as data extracted from A-series surficial geology maps and from digital elevation models (DEM). Extensive areas of the Slave Province are overlain by till, which is the most common deposit in the area. It is divided into three subunits based on thickness and surface morphology: veneer (generally <2 m thick), blanket (2 to 10 m thick), and hummocky till (5 to >10 m thick). Glaciofluvial deposits are geographically widespread but limited in extent, and range from a few metres thick to 10's of metres. Glacial lake sediments are only identified in a few locations, generally <4 m thick and also limited in extent. Polygons representing these various surficial units on maps are converted to points that outline the perimeter of the polygon. The bedrock elevation database is modeled in stages in order to establish the effects of each surficial unit on the drift thickness model.

The first model incorporates depth-to-bedrock data determined by diamond drill-holes (535 locations) with point elevations that correspond to the perimeter of outcrop polygons and individual outcrops as obtained from surficial geology maps. Points located at the edge of outcrop polygons are assigned the elevation of the DEM. A natural neighbour interpolation is then carried out to create a model of the bedrock surface. Outcrop polygons are then 'stamped' with the corresponding clipped region of the DEM to provide an elevated surface for these regions that overrides the modelled surface. The bedrock elevation dataset is merged with the DEM using the minimum value to ensure that the modelled depth-to-bedrock is never at a higher elevation than the DEM. The resulting bedrock elevation model is subtracted from the DEM to establish a drift thickness model.

Both the bedrock elevation and drift thickness models are modified by adding additional polygon elevation data from surficial geology maps. Till veneer polygons are assigned a 'best approximation' thickness by applying a point inspection from the DEM minus 2 meters, whereas till blanket, hummocky till, and eskers are assigned the DEM elevation minus 10 meters. All polygons other than the outcrops are buffered inwards 100 meters to eliminate overlapping points that may have conflicting bedrock elevations. Progressively adding each surficial geology data set to the previous modelled database is carried out in order to establish how each dataset modifies the drift thickness model. Once the drift thickness model is completed cross-sections can be established in areas of interest.

CRUSTAL GROWTH VS CRUSTAL REWORKING IN THE WESTERN SLAVE PROVINCE BASED ON ZIRCON U-PB AND HF ISOTOPIC DATA

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Zircon is widely used as a U-Pb chronometer but also incorporates significant amounts of hafnium (Hf) during igneous crystallization. The isotopic composition of Hf in igneous zircon provides insights on the relative contributions of crustal and mantle sources during magma genesis.

We have determined the U-Pb age and Hf isotopic composition of magmatic zircons from the western Slave Province. U-Pb ages were determined by isotope dilution – thermal ionization mass spectrometry, laser ablation – inductively coupled plasma mass spectrometry; and/or sensitive high resolution ion microprobe (SHRIMP). Hf isotopic ratios were measured by laser ablation – multiple collector – inductively coupled plasma mass spectrometry. All laser ablation work was carried out at Macquarie University, Sydney, Australia. Laser ablation and SHRIMP spot analyses allow small areas of single zircons to be studied, which is important as some grains contain multiple growth zones or inherited zircon cores.

Eighteen granitoid samples with ages between 4.0-2.58 Ga have initial epsilon Hf isotopic compositions that plot mainly between the depleted mantle (DM) and chondrite uniform reservoir (CHUR) model growth curves. Oldest zircons from the Acasta gneiss region tentatively suggest both the existence of a depleted mantle at 4.0-3.8 Ga and the involvement of older crust in magma genesis, particularly at ca. 3.8 Ga and 3.53 Ga (as indicated by negative epsilon Hf values). Epsilon Hf values greater than DM must be treated with caution until we can assess the role of zircon alteration on Hf initial ratios. Uncertainties inherent in laser ablation Hf isotopic analysis must also be considered. At younger ages, both depleted mantle and older crustal signatures are apparent. For example, 3.32-3.25 Ga zircons show mainly positive epsilon Hf with little evidence of older crustal involvement, whereas most 3.0-2.8 Ga analyses plot well below DM and extend to negative values. Both depleted mantle and crustal signatures are evident at 2.73-2.67 Ga.

Our Hf isotope data also indicate significant $^{176}Hf/^{177}Hf$ variability (outside of analytical error) within individual zircon populations. Although controversial, we attribute this mainly to isotopic variation within the magma chamber during zircon crystallization, and/or to the presence of zircons that formed in isotopically distinct magma batches. Despite this complication, the Hf isotopic signature of Slave Province magmatism indicates both regional and temporal changes in the competing processes of crustal growth and crustal recycling. At various times, depleted mantle magmas were fundamentally involved in crust generation whereas at others, magmas contained a significant component of recycled older crust. A significant observation is that crustal melting appears to have mainly involved rocks no more than a few hundred million years old, as indicated by epsilon Hf values that extend only to -4. Potential reasons for this include (i) restriction of 'old' (pre-3.5 Ga) crust to the core of the growing Slave proto-continent, and (ii) difficulty in obtaining additional melts from a previously-melted crustal volume. In summary,

the western Slave Province has a long and complex geological evolution that involved both net crustal growth and extensive magmatic/metamorphic reworking.

PRELIMINARY DATA FROM A METASEDIMENTARY SUCCESSION IN THE RAE DOMAIN, SOUTHERN BOOTHIA PENINSULA, NUNAVUT.

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Regional bedrock mapping in 2005, conducted as part of the joint GSC-CNGO Boothia Integrated Geoscience Project, located outliers of a metasedimentary belt on southern Boothia Peninsula. One of these outliers measuring roughly 15km x 7km was selected for detailed mapping and follow-up analyses in an undergraduate thesis. A Paleoproterozoic depositional age is tentatively inferred based on the abundance of carbonate in addition to lithologic similarities with Paleoproterozoic supracrustal belts of Western Churchill Province such as Chantrey Group (Rae Domain) and Hurwitz Group (Hearne Domain). The basal contact with presumed Archean granites and gneisses appears to be an unconformity that has been sheared, and possibly faulted locally, during folding. The arenite- and carbonate-dominated lower assemblage is conformably overlain by a composite unit predominantly composed of metapelitic rocks, which contain common layers of banded iron formation and diminishing proportions of calc-silicate, quartzite and garnet amphibolite. Migmatization is widespread in pelitic rocks; the peak mineral assemblages, including bt-grt-crd-kfs and bt-sil-grt-kfs, are indicative of upper-amphibolite- to granulite-facies conditions. Bedding is well preserved in more competent units: carbonate, quartzite and meta-arkose. The belt records at least two episodes of superposed folding, which created a complex basin structure. A prominent stretching lineation in metapelites, and locally in basement rocks, plunges moderately toward 300º and is associated with the youngest deformation. The metasedimentary succession is cut by post-tectonic diabase dykes and local occurrences of granite. Intended work involves detailed petrography, kinematic analysis of folding and determination of the P-T-t history of the belt. Analyses will include geochronology of metamorphism(s) as well as emplacement ages of basement and crosscutting intrusions using the laser ablation multi-collector ICP-MS at the University of Alberta. Quantitative P-T conditions will be determined using the same university's electron microprobe laboratory.

DETAILED RELATIONSHIPS OF IOCG-TYPE ALTERATION ZONES AT DEVRIES LAKE, SOUTHERN GREAT BEAR MAGMATIC ZONE, NWT.

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Iron oxide Cu-Au-Ag-U-Co-Bi (IOCG) mineralized systems along the 1.87–1.84 Ga Great Bear Magmatic Zone occur largely among associated volcanic sequences and within remnants of older deformed and metamorphosed Treasure Lake-type sedimentary rocks. At DeVries Lake, approximately 300 kilometres northwest of Yellowknife, mineralization includes sediment-hosted stratabound Cu+Co+W, felsic volcanic-associated U, and granite-related Cu+Co+Mo occurrences. In 2005, during the course of NTGO's South Wopmay Bedrock Mapping Project, targeted mapping and sampling in the DeVries Lake area, followed by feldspar staining of representative samples, found evidence for penetrative and vein-type sodic/calcic, iron oxide and potassic alteration that collectively point to a potential IOCG mineralizing system. Thin to thick-bedded siltstones, typical of the Treasure Lake Group, that appear largely unaltered in the field, show weak potassic alteration along bedding planes upon staining. In some outcrops, sedimentary layers are particularly rich in albite (white layers), amphibole (dark green layers), K-feldspar (pink layers resembling arkose) or magnetite. Their collective appearance, among otherwise typical sedimentary rocks, point to lit-par-lit sodic, calcic, potassic, and iron oxide alteration. Some of the magnetite-rich layers could be primary in origin; however, fragmental volcanic rocks with remarkably preserved primary textures are pervasively altered by albite-amphibole or magnetite supporting the interpretation that sedimentary-looking magnetite-rich layers may locally be secondary. Albitization can be texture-destructive and at the extreme lead to a penetrative nodular texture highlighted by a regular veined network of amphibole alteration. Staining has also shown faint potassic alteration along small veins that crosscut albitized and amphibole-altered rocks. The lit-par-lit altered layers in the metasedimentary package are folded and crosscut by quartz-magnetite veins and by syndeformational granitic dykes and veins. Pink feldspathic orthogonal vein networks that locally contain epidote, overprint all alteration facies. Sporadic Cu-sulphide mineralization, spectacular intrusion breccia and local migmatization of metasedimentary rocks were also observed. Problems remaining to be addressed include the extent, nature, and timing of the pre-, syn- and post-deformation alteration, the extent and polymetallic potential of the hydrothermal activity, the role of magmatism and Wopmay fault in inducing deformation and channelling hydrothermal fluids. Field interpretation and staining results confirm sodic/calcic and potassic alteration and overprinting relationships providing essential data for vectoring in on new mineralization.

RICHARDSON MOUNTAINS, TRAVAILLANT LAKE AND LOWER WILLOWLAKE RIVER REGIONAL HEAVY MINERAL CONCENTRATE DATA PRESENTATION AND INTERPRETATION.

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Since 2003, the Northwest Territories Geoscience Office (NTGO), in partnership with the Geological Survey of Canada's National Geochemical Reconnaissance program, has been leading the implementation of modern-alluvium geochemical sampling programs in the Mackenzie Valley in support of land use decision-making processes in the Northwest Territories. The data include analytical, mineralogical, and kimberlite indicator mineral (KIM) data from silts, heavy mineral concentrates, and water samples.

The poster illustrates the results from three surveys carried out: Richardson Mountains, Travaillant Lake, and lower Willowlake River areas of the NWT during two field seasons (2003-2004). The focus of the poster is on the KIM interpretation.

Heavy mineral concentrate (HMC) samples were collected from 127 sites in the Richardson Mountains, 37 from Travaillant Lake and 102 sites from the lower Willowlake River area of the western Horn Plateau. Results are interesting from all 3 areas with abundant KIMs recovered from each program. The Willowlake River results are particularly interesting with 420 peridotitic garnets recovered from the 102 sites. Of these 42 are classified as G10, 10 of which are classified as G10D.

In the summer of 2005 an additional 226 HMC samples were collected from the central and eastern Horn Plateau, completing the sampling program over the area. Results are pending.

NON-RENEWABLE RESOURCE ASSESSMENTS-PROGRESS REPORT (NOV. 2004-NOV. 2005)

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The Northwest Territories Geoscience Office (NTGO) is active in non-renewable resource assessments (NRA) as part of the NWT Protected Areas Strategy (PAS), and land use planning efforts (Gwich'in Settlement Area Conservation Zones).

NRA Phase II fieldwork at Sahoyúé - §ehdacho candidate protected areas (PAS) was completed in 2003, and results were released as NWT Open File 2005-01.

NRA Phase II fieldwork at Edehzhie candidate protected area was completed in 2005. A geochemical survey covering an estimated 20,000 km^2 was carried out. Approximately 365

stream sediment samples, 365 water samples, and 226 heavy mineral concentrate samples were collected. The NRA Phase II geochemical survey was initiated in 2003 over the western quarter of Edehzhie. 2003 results were released as Geological Survey of Canada (GSC) Open File 4674 (NTGO Contribution 0007).

The NRA Phase I report for three Gwich'in conservation zones (identified in the Gwich'in Land Use Plan) was released as NWT Open File 2005-02. Results from Phase II fieldwork in the Richardson Mountains (carried out in the summer of 2003) were released as GSC Open File 4670 (NTGO Contribution 0006). Phase II fieldwork in the Travaillant Lake area was completed in the summer of 2004, and a GSC Open File report of the sample results is expected in late 2005. It is expected that a NRA Phase II report for the Gwich'in Conservation Zones, incorporating the geochemical survey data, will be completed in 2006.

In support of the NWT PAS Five Year Plan to identify areas of ecological importance in the Mackenzie Valley region, mineral and petroleum potential mapping projects were initiated in 2004. A qualitative hydrocarbon potential map for Sahtu and Gwich'in settlement areas was released as NWT Open File 2005-04. A compilation of digital shape files of hydrocarbon plays, and areas of comparative high to low potential in the Mackenzie Valley region, was released as NWT Open Report 2005-004. A mineral potential map for the Mackenzie Valley region will be released in late 2005.

U-PB AGE CONSTRAINTS ON THE GEOLOGIC EVOLUTION OF THE TSU LAKE AREA, TALTSON MAGMATIC ZONE

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Based on a collaborative mapping project between the University of Alberta and the Northwest Territories Geoscience Office, the geology of Tsu Lake, N.W.T., was the focal point of a field-based study in August 2005. Tsu Lake is located approximately 60 km north of Fort Smith and is situated in the southern Taltson-Thelon Orogen. Previous mapping at 1:250,000 (Bostock, 1982; GSC Open File 859) and geochronology (Bostock and Loveridge, 1988) identified two major batholiths, the Konth and the Slave. Based on previous mapping, the Konth granite (1.93 Ga) comprises the eastern part of the map area and the Slave granite (1.95 Ga) comprises the western portion.

Based on more detailed mapping (1:30,000) during this study, five distinct plutonic episodes were identified in the area and are constrained by crosscutting relationships. They are from oldest to youngest; hornblende biotite granodiorite, in situ syenogranite leucosome development, k-feldspar phyric syenogranite, biotite leucogranite and undeformed pegmatite dykes.

The scope of this study is to gain further insight into the detailed magmatic history of the Taltson Magmatic Zone, in the Tsu Lake area. An integrated approach involving detailed mapping, petrography, geochemistry and geochronology utilizing laser ablation multi-collector inductively coupled mass spectrometry (LA-MC-ICPMS) U-Pb in situ dating, will be used to constrain the nature, tectonic affinity, and timing of magmatism in the Tsu Lake area. In addition, the ages of granite magmatism will help to constrain the timing of deformation in the region. One of the major highlights from the mapping project was the discovery of a major north-south trending expansive mylonite shear zone in northeastern Tsu Lake. All granites in the area display localized mylonite texture with the exception of the undeformed pegmatite. The age data from the youngest deformed biotite leucogranite and the oldest undeformed pegmatite will bracket the timing of shearing in the area.

SEKWI MOUNTAIN PROJECT: RESULTS OF RECONNAISSANCE MAPPING AND DIGITAL COMPILATION

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The Sekwi Mountain (NTS 105P) mapping project, initiated by the Northwest Territories Geoscience Office is intended as a 3-year multidisciplinary study. This project aims to provide a better understanding of the stratigraphy, geochronology, geochemistry, metallogeny, and tectonic history of a segment of the Mackenzie Mountains, primarily along the Canol Trail. The area is prospective for a variety of deposit types including stratiform Pb-Zn-Cu, stratabound Zn-Pb±Cu-Ag-Ba, polymetallic veins, tungsten, gold, and gem beryl in skarns, as well as Li and REE in pegmatites. A number of showings were previously recognized in the vicinity, some of which have reached advanced exploration stage and are currently being re-investigated (Howards Pass, Mactung, Cantung, Bear-Twit, Coates Lake, Gayna River, Lened).

The NTGO recently funded two combined magnetic and radiometric surveys in the Sekwi Mountain area. The adjoining surveys were flown over a NE-trending swath of ground about 17 km wide, roughly following the Canol Trail for 125 km from Mactung in the southwest to near the Keele River in the northeast. The transect covers Neoproterozoic to Devonian sedimentary rocks that are intruded by Cretaceous plutons in the southwest. The two surveys will be published later this winter or early next spring, by the Geological Survey of Canada and NTGO. As part of the Geological Survey of Canada National Geochemical Reconnaissance program, regional stream sediments and water geochemical data were collected and published in the fall of 2005 (Day et al., this volume).

In July 2005, a Zn-Pb±Cu-Ag mineral showing examination was undertaken with Eagle Plains Resources, north of the Canol Trail and south of 65º (Dewing et al., this volume; Sharp et al., this volume; Turner, this volume). Ongoing petrogenic studies of selected showings will be integrated into the mapping project. In addition, one week of reconnaissance mapping was conducted in September 2005. Robert MacNaughton (Geological Survey of Canada, Calgary)

accompanied geologists of the NTGO and provided insight on outstanding questions pertaining to the geology of the Sekwi Mountain area. Mapping strategies remain to be defined, but will primarily consist of targeted 1:50 000 scale mapping of 105P, along the Canol Trail.

A digital compilation of the Selwyn area is underway. The 1:250 000 scale geology for several map sheets (NTS 95L, M; 96D; 105I, P; 106B) has been vectorized and mineral showings data compiled into NORMIN database. The compilation will include all publicly available data, including satellite imagery, an airphoto mosaic, scanned stratigraphic sections, vectorized geology, geotiff images of magnetic and radiometric data, stream geochemical data, and new data collected during 2005 reconnaissance. With all digital data compiled, we intend to produce a remote predictive map, which will help target field-based studies and enhance the final product.

STRUCTURAL AND METAMORPHIC ANALYSIS OF A FOLDED ARCHEAN – PROTEROZOIC BOUNDARY, MATTBERRY LAKE, NWT

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A folded unconformity is exposed near the western edge of the Slave Craton, at Mattberry Lake, NWT. Low-grade Proterozoic strata of the Snare Group overlie granitic and migmatitic rocks that are presumed to be an Archean basement. The Archean rocks consist of highly strained granite, pegmatite and metasedimentary migmatite, which retain evidence of 2 phases of deformation prior to deposition of the Snare Group. Interbedded siltstone, psammite, quartzite, and pebble conglomerate are characteristic of the Snare Group sequence in the study area. Excellent exposures display both granite – Snare Group and migmatite – Snare Group contacts, as well as the angular unconformity between them. The unconformity is outlined by a basal quartz pebble conglomerate and is also marked by metamorphic grade contrasts and the truncation of granitic and quartz veins within the Archean rocks. The Snare Group strata are preserved within a south-plunging fold that has a kilometer-scale wavelength. Micro- and mesoscopic folds are developed in all units, but fold styles differ due to competency contrasts. Both Archean and Proterozoic rocks display a well-developed cleavage that is folded by the predominant fold set, indicating that these folds are at least second-generation structures (F2). The major folding event may be coincident with the closing phases of deformation related to the Wopmay Orogen (ca.1.85 Ga).

This project aims to further characterize the deformation style along the unconformity, as well as document the relationships between metamorphism and deformation. It is being done as part of the Northwest Territories Geoscience Office South Wopmay Bedrock Mapping Project.

IRON-OXIDE CU-AU-AG-U-CO-BI MINERALIZED SYSTEMS OF THE CONTACT LAKE BELT, GREAT BEAR MAGMATIC ZONE, NWT

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The Contact Lake Belt forms the southern flank of an andesite stratovolcano complex within Labine Group volcanic rocks of the northern Great Bear Magmatic Zone, NWT. The belt consists dominantly of fine-grained tuff, breccia and flows of andesitic composition, that are intruded by a monzodiorite sheet of the Mystery Island suite. Local conglomerate and arkose beds are conformably intercalated with volcanic rocks, suggesting construction of at least part of the complex in a shallow water, marginal marine environment. A pervasive chlorite-epidote-carbonate-sericite alteration in the least-altered volcanic rocks may reflect seawater infiltration. Deformation of the andesite, monzodiorite, conglomerate and arkose to a gently north-dipping (~25^{o} to 30^{o}) near homoclinal sequence is attributed to a differential collapse of the stratovolcano into an evacuating sub-caldera magma chamber near the end of volcanic activity. Subsequent disruption of the Contact Lake Belt was a consequence of multiple episodes of syn- to post-volcanic shearing and fracturing, associated in-part with caldera-bounded faults. Two orthogonal, NE-NW and NS-EW trends currently dominate.

Extensive polyphase hydrothermal alteration affects all rocks of the belt, although the effects are most visible and intense in andesite. Alteration styles include large pervasive zones with varying assemblages of potassium feldspar, sericite, albite, hematite, magnetite, actinolite, pyrite and silica as well as patches, veins, stockworks, and diatremes with tourmaline, quartz, hematite, jasper, manganese, magnetite, apatite, sulphides, and at least one unknown submetallic phase. The most spectacular alteration facies include: 1) massive white albitites that are locally laced with amphibole, 2) potassium feldspar-tourmaline-iron-oxide-silica-sulphide altered rocks, 3) km-scale megacrystic feldspar-magnetite-actinolite-apatite alteration, and 4) earthy hematite zones. A hydrothermally altered diatreme with ultramafic and jasper clasts occur to the southwest of the belt.

All major hydrothermal alterations of the belt are locally associated with potentially economic sulphides. Mineralization is polymetallic, with varying combinations of Cu-Ag-Au-U-Co-Bi-Zn, and occurs as veins, breccias, disseminations and replacements in hydrothermally altered and structurally disrupted zones. The geochemical, alteration and structural associations observed along the belt support classification of this system as a hydrothermal and polymetallic IOCG type deposit setting.

FRACTURE PATTERN OF THE BOOTHIA MAINLAND, NUNAVUT: AN ANALYSIS OF DYKES, FAULTS, FRACTURES AND LINEAMENTS

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This study, part of the Boothia Peninsula Geoscience Project (Ryan et al. *this volume*), focuses on the brittle deformation and diabase dyke events that have affected the Boothia Mainland since its cratonization in the early Proterozoic.

The region comprises three physiographic subdivisions hereafter referred to as the western lowlands, the central uplands and the Pelly Bay rise. The western lowlands comprise a vast area of monotonous marshlands breached by rare eskers, with elevations gradually rising eastward from sea level, to ~100 m over ~50 km. Outcrops are sparse, with very local preservation of Paleozoic cover. The central and northern parts of the region feature gently rolling uplands with elevations generally ranging between 150 and 250 m, locally reaching ~300 m. It is moulded by a network of sub-parallel, linear and aligned depressions, some corresponding to, and accentuated by, the SW-NE flow of the Laurentide Ice Sheet. The NE-SW trend that dominates the fine details of the landscape is intersected by NW-SE more subdued lineaments and trough-like depressions (e.g., Simpson Lake valley and Halkett Inlet). The coastal area and islands of the east side of Pelly Bay stand as a topographic rise trending NNE, 10-20 X 100 km in extent, marked by rugged, hilly landscape with incisive valleys, steep uprises and hill tops locally reaching over 300 m.

The limits of these physiographic subdivisions are marked by prominent lineaments and fracture zones, some with topographic breaks signalling major normal faults. The fracture pattern, as revealed from the statistical analysis of field data, DEM and remote sensing is marked by four main sets of fractures with mean orientations varying slightly across the region. While NE-SW and NW-SE fractures are ubiquitous and prominent, E-W and N-S features are more widely spaced and subdued.

Three regional, unmetamorphosed diabase dyke sets are recognized in the region with dykes more abundant in the south than in the north. Dykes of the E-W and ENE-WSW sets have not been previously reported. They rarely exceed a few 10's of meters in thickness, and exhibit aphanitic to very fine-grained textures, locally with centimetre-size plagioclase phenocrysts and rounded wallrock inclusions. These sets are cut by NW-SE trending dykes, commonly > 50 m thick, regarded as being part of the ca. 1267 Ma Mackenzie swarm. In addition, partly mylonitized, N-S trending, vesicular and thin diabase dykes are reported from two localities in the north.

As a whole, the physiography and the topographic details are a direct manifestation of the basement's brittle deformation pattern and history. The close spatial correspondence between the

NW-SE and E-W fracture sets and the dyke swarms suggests that they might be rheologically related. Evidence that faulting has been active beyond the Mesozoic - Cenozoic exhumation is manifest in the rugged topography of the Pelly Bay rise.

UPDATE: GEOLOGICAL COMPILATION OF THE MACKENZIE MOUNTAINS, NWT.

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The importance of the geology of the Mackenzie Mountains region has come to the forefront due the re-appearance of exploration companies looking for mineral resources and extensive land use planning exercises. Geological mapping and research in the region has been largely dormant since the 1980's with a few notable exceptions. Fortunately geological mapping and research has continued in British Columbia and the Yukon Territory, advancing the state of geological comprehension of many units exposed in the Northwest Territories.

This project has compiled and re-examined the geological mapping of the southern Mackenzie Mountains. The aim of the compilation process was to produce a factual display of mappable units as small as individual formations wherever possible, with a minimum of interpretation. A compromise was sought between questionable interpretation and unreadable fragmentation of map units. The attempt was to produce more interpretive maps to adequately portray the available information.

Compilation began with a prototype drawing, registered to UTM coordinates. Several drawing files were created and added concurrently, as compilation proceeded. AutoCAD drawing files were given standard designations to aid organization and flow of data from acquisition to publication. Geological linework and symbols were placed in GEOLOGY. The source material was referenced in REFS, and the outline of the map-area, with author and date were placed in CSMCOMP (compilation source map, compilation stage).

Geological units were assigned a provisional symbol and colour, which were entered into LEGEND along with the unit name or lithologic description. Unit names and lithologies were merged into a single stratigraphic assemblage, with consideration given to the existing terminologies in adjacent provinces and territories. From the source maps and/or reports, information about each unit (unit name, lithology, age or age range, relationships to adjacent units) could be drafted into the correlation charts on SHEET2-E.

Upon completion to first draft stage, geological linework, map unit symbols and legends of all maps in the set were diverted to files for entry into geographic information systems. The production stage began by combining the files GEOLOGY and LEGEND into file SHEET1-E, together with surrounding items from the guide library. Descriptive notes were written, given

preliminary review, drafted into file DESCNOTE and placed into SHEET1-E. Layout of all other sheets was finalized and compilation files are assigned to appropriate SHEET files. After critical review and necessary amendments, Postscript files are prepared for the printer.

The Redstone map sheet NTS 95 has been completed and additional map sheets from 105, 106 and 96 are currently being added.

This poster displays the current status of this compilation, with its legend as well as outlining the future additions.

TWO DISTINCT TURBIDITE SEQUENCES IN THE SOUTHWESTERN SLAVE CRATON: SHRIMP U-PB DETRITAL ZIRCON EVIDENCE WITH REGIONAL CORRELATIONS

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Sensitive High Resolution Ion Microprobe (SHRIMP) U-Pb detrital zircon analyses were undertaken to constrain the maximum age of turbidite packages in the Russell-Mosher lakes area of the southwestern Slave craton. The SHRIMP U-Pb results, coupled with field observations, highlight two distinct turbidite sequences, referred to herein as the Mosher Lake and Russell Lake turbidites. The Mosher Lake sequence consists of monotonous greywacke-mudstone turbidite, contains a mafic volcanic belt, and stratigraphically overlies a ca. 2658 Ma felsic volcanic pile. In contrast, the Russell Lake turbidites contain abundant interbedded silicate, sulphide, oxide, and carbonate iron formation. Single greywacke samples from each turbidite sequence are dominated by zircons with 2680-2730 Ma ages, with only minor contribution from Mesoarchean sources (i.e., Central Slave Cover Group and Central Slave Basement Complex). Maximum depositional ages are estimated from replicate analyses of the youngest zircon determined in each sample. The Mosher Lake greywacke sample yields a maximum depositional age of 2651 ± 5 Ma (n = 6; 2σ), whereas the greywacke sample from the Russell Lake turbidites yields a maximum depositional age of 2625 ± 6.4 Ma (n = 5; 2 σ).

Regional correlations, based on available geochronological data and the occurrence of interbedded iron formation, indicate that the Mosher Lake turbidites are correlative with the ca. 2661 Ma Burwash Formation east of Yellowknife and the ca. 2647 Ma Parker formation in the Indin Lake area to the north. The Russell Lake turbidites are correlated with the <2630 Ma iron formation-bearing Damoti formation in the Indin Lake area. Both the Russell Lake and Damoti turbidites host numerous iron formation-associated gold occurrences (e.g., Bugow and Horseshoe deposits) and define a post-2630 Ma iron formation-associated gold metallotect in the southwestern part of the craton. Further SHRIMP U-Pb detrital zircon geochronology on greywacke samples collected from the Emile River (along strike from Damoti and interbedded with iron formation) and Point Lake areas (both the Itchen Formation and the iron formation-

bearing Contwoyto Formation) are aimed at defining whether post-2630 Ma iron formation-bearing turbidites occur across the Slave, or if this age-iron formation association is restricted to distinct areas within the craton.

SCOPE AND MINERAL POTENTIAL OF A NEW GRANULITE DOMAIN IN THE SOUTHERN RAE: SURPRISES FROM "ARCHIVAL MAPPING" OF THE SOUTHEAST FRONTIER OF THE NWT

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See Talks

2005 RECONNAISSANCE PROGRAM: REGIONAL GEOSCIENCE STUDIES AND PETROLEUM POTENTIAL, PEEL PLATEAU AND PLAIN

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See Talks

GEOCHRONOLOGICAL AND LITHOGEOCHEMICAL STUDY OF INTRUSIVE ROCKS IN THE NAHANNI REGION, MACKENZIE MOUNTAINS, NORTHWEST TERRITORIES AND YUKON

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A study of intrusive rocks and the potential for related mineralization in the Mackenzie Mountains of the southwestern Northwest Territories and southeastern Yukon was initiated in 2004 as one component of the 2004-2006 Nahanni MERA. Intrusions within the study area represent the southeasternmost extent of the Tintina Gold Province (TGP), an elongate band of mid- and Late Cretaceous intrusions that extends northwest from the study area across Yukon and into central Alaska. The TGP is characterized by the numerous precious and base metal deposits and occurrences that are spatially and genetically related to Cretaceous intrusions. Intrusive rocks underlie a substantial portion of the study area, and range from large batholithic bodies to small stocks and dykes. Most of the intrusions are felsic in composition and have a relatively restricted range of lithology and mineralogy, although a considerable range of textural variations (QFP to megacrystic; aplitic-pegmatitic dykes; quartz-(tourmaline) veins; and sheeted

gossanous fracture sets) is observed. Several intrusions in the study area are spatially associated with tungsten (+/-copper, gold, antimony, bismuth, and gem) deposits and occurrences; however no specific geochemical or geochronological correlations have been established yet for the various styles of mineralization. This study will include a detailed geochemical and geochronological characterization of intrusions in the study area in order to correlate magmatism in the study area with well-constrained plutonic suites associated with mineralization in the TGP to the northwest (Mortensen et al., 2000; Hart et al., 2004), and to identify specific characteristics of intrusions associated with mineralization within the study area. In addition, the halogen contents of micas and apatites within the intrusions will be examined in order to identify which intrusive phases have exsolved a volatile phase that may be associated with a mineralizing event. Lead isotopic studies will be done on both the intrusions possible wall-rock (sedimentary) sources of Pb and S, to test the inferred genetic relationship between mineralization and the intrusions and to identify the origin of showings in the area not clearly associated with Cretaceous magmatism. P-T-t studies will identify depths of emplacement and the cooling history of the intrusions using metamorphic mineral assemblages in contact aureoles combined with hornblende-geobarometry and Ar-Ar and He ages determined from igneous micas and apatites. A final aspect to the study will be the examination of gold grain morphologies and compositions from drainages in the region that contain placer gold in order to approximate the distance to and most likely type of, lode gold source(s). In much of the study area, the potential for intrusion-related precious and/or base metal mineralization is still uncertain; however the 2005 field component has led to the identification of several showings that may have a previously unidentified intrusive source. Initial U-Pb and Ar-Ar dating results for several of the intrusions in the study area as well as preliminary interpretations of lithogeochemical studies of the intrusive rocks will be reported along with preliminary results of the examination of placer gold grains that were previously recovered from the study area by C. Jefferson.

GEOLOGY OF THE TSU LAKE AREA, NWT: NEWLY-DISCOVERED TECTONITES AND OTHER TITILLATING HIGHLIGHTS.

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Tsu Lake area, 60 km north of Fort Smith, lies within the ca. 1.9-2.0 Ga Taltson Magmatic Zone and was mapped most recently by Bostock (1982; GSC Open File 859). The magmatic zone has been interpreted both as an arc formed at a Paleoproterozoic continental margin, and as a zone of intracontinental crustal-derived melt formed in the hinterland of a more distal collision. For 10 days this summer, 1:30,000 mapping was undertaken by students at University of Alberta's Department of Earth and Atmospheric Sciences as part of the NWT Field School; highlights are presented below.

Central Tsu Lake is underlain by paragneisses with compositions that suggest derivation from a supracrustal succession consisting of turbidite, quartzite, mafic volcanic rocks, and minor iron

formation. The paragneisses define a gently east-dipping panel with a complex folding history. Ongoing studies of this supracrustal package (Blackburn and Chacko, this volume) will consider their possible depositional setting, provenance and age.

Plutonic rocks comprise five phases, dominated by Kspar-porphyritic granite. Cross-cutting relations were observed between four of them. From oldest to youngest they are: biotite granodiorite; Kspar-porphyritic granite; leucocratic syenogranite; and pegmatite. A study of the age and petrology of the fifth unit, a small gabbro pluton, will be undertaken this winter (Milner). Although limited geochronologic data suggest the Kspar-porphyritic granite west of the paragneisses is older than that to the east (ca. 1.95 Ga vs. ca. 1.93 Ga), compositionally and texturally the units are indistinguishable. Local gneissic enclaves, biotite schlieren and accessory garnet indicate significant crustal interaction and the potential for complications interpreting U-Pb age data (e.g. zircon inheritance). Granitoid samples were collected for in-situ laser ablation U-Pb dating (Leslie and Heaman, this volume), and will assist in bracketing the timing of magmatic and deformational events.

One of the highlights of the mapping project was the discovery of a previously-undocumented shear zone through the area. It comprises a north-striking zone of anastomosing mylonites over 3 km wide (width unconstrained) that was traced for 20 km along strike, and is spectacularly developed in the Kspar-porphyritic granite east if the lake. Evidence for reactivation of the shear zone includes zones of brecciated mylonite, vuggy quartz veins, and silica alteration. Ongoing studies (Anderson) will provide insights into its shear sense and regional significance.

Several diabase dykes transect the study area, including two 130^{o}-striking dykes that were examined in detail. They contain abundant entrained xenoliths of country rock concentrated within discrete zones, possibly indicating channeled flow within the dykes. The xenoliths are variably resorbed, indicating a range of magma residence times during emplacement. Also observed was evidence for localized melting of wallrock and co-mingling of the diabase and anatectic melt. These features presented some of the most extraordinary examples of dyke emplacement textures, and are the focus of ongoing study (Ewanchuk and Heaman, this volume).

The field school served to highlight the complex history of the area and identify some significant tectonic questions. Ongoing studies will contribute to an improved understanding of the geology and highlight opportunities for further research.

PRELIMINARY RESULTS OF REGIONAL BEDROCK MAPPING OF THE KUGAARUK (57A), RAE STRAIT (57B), AND HARRISON ISLANDS (57D) MAP SHEETS, BOOTHIA MAINLAND AREA, KITIKMEOT REGION, NUNAVUT

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See Talks

KIMBERLITES AND OTHER INTRACRATONIC, MANTLE-DERIVED SUITES IN THE NORTHWEST TERRITORIES AND NUNAVUT: PRESENT ACTIVITIES OF THE NTGO DIAMOND PORTFOLIO.

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Research is being undertaken to better understand the distribution and composition of "non-kimberlitic" sources of indicator mineral species. The mineralogy and mineral chemistry of mafic-ultramafic and alkaline rocks of the Northwest Territories and Nunavut are being examined and compiled. These studies will tabulate and characterize mineral chemistry from indicator and non-indicator mineral species from a range of mafic magmatic suites. Some of the suites currently under investigation include: the Kaminak, MacQuoid, Malley, Mackay, Lac de Gras, MacKenzie and Franklin mafic dyke/sill complexes; a plethora of poorly characterized mafic intrusions; alkaline carbonatite complexes of the NW Canadian shield; gabbroic anorthosites of the Snowbird Tectonic zone and ultrapotassic flows and dykes of the Proterozoic Christopher Island Formation. Construction and evaluation of these datasets along with supporting petrochemical research will help to further our understanding of chemical and temporal evolution of the sub-continental lithosphere of the northwestern Canadian Shield and facilitate the recognition of non-kimberlitic grains picked during drift exploration for kimberlites.

In addition to these thematic research topics and following the earlier initiatives by government diamond geologists, the Slave Province-based databases including: Kimberlite occurrences; KIDD - Kimberlite Indicator and Diamond Database; and KIMC - Kimberlite Indicator Mineral Chemistry database are continuing to grow and are being updated as data becomes available. Two other prominent diamond related databases (SMAC - Slave Magnetics Compilation and KANDD - Kimberlite Anomaly Drillhole Database), are being evaluated for updating and enhancement. New KIDD and KIMC data is being made available for download through the

NTGO Gateway Web application. In addition to datasets for the Slave Province, compilations of comparable data for other prospective kimberlite/diamond areas, including the Northern Mackenzie Valley (Northern Interior Platform) and the Churchill Province, have been initiated. These will include KIDD- and KIMC- type compilations from publicly-available industry assessment reports, published scientific literature as well as existing government database collections. Compilations of kimberlite-targeted drillholes and aeromagnetic survey compilations for the Churchill and Northern Interior Platform are also planned as future initiatives. These new datasets will be released by both the NTGO and the Nunavut INAC regional office.

It is emphasized that these are ideas and works 'in progress'. Suggestions for research avenues along with partnerships with interested industry and university clients are welcome.

GRANULAR AGGREGATE ASSESSMENT SURVEY, IQALUIT, NUNAVUT

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In 2005, a granular aggregate assessment was carried out in the area around the city of Iqaluit, Nunavut. The survey was done to address immediate concerns with depletion and environmental issues involving the current source of aggregate for Iqaluit, the North 40 Pit. Alternate sources of aggregate are urgently needed to address infrastructure needs for the rapidly growing capital city. Based on the results of this survey, the purpose of this poster is to present a general procedure that can be applied towards future aggregate assessment surveys in Nunavut.

To carry out the survey, all potential areas of aggregate were initially identified through air-photo interpretation. This information, combined with a review of previous assessment reports and meeting with federal and territorial representatives provided a focus on which to base field work. Target areas with the best potential to yield economical aggregate resources were visited in the field where general information was gathered regarding the nature of the deposits, the extent and volume of the deposits, and the general physiography of the area to determine ease of accessibility. Ground Penetrating Radar (GPR) data was collected to image the character of the subsurface deposits, and bedrock contact.

The results of the assessment identified two areas as high priority. The Northwest Area, which is approximately 24 times the area of the North 40 Pit, contains good quality aggregate, including high quality gravel with an expected minimum volume estimates of 1,000,000m^3 of gravel alone and well in excess of 4,000,000m^3 of combined sand and gravel. Total potential aggregate could reach in excess of 14,000 000m^3 for the Northwest Area. The Tarr Inlet area, which is approximately 1.5 times the area of the North 40 Pit, contains undifferentiated sand and gravel deposits. The total volume of undifferentiated sediments for the Tarr Inlet area is 295,070m^3 for a minimum volume estimate, and 762,289m^3 for an average volume estimate. Gravel quantities within the Tarr Inlet area are expected to compose less than half of the total aggregate volumes. The Northwest Area is a good long-term option for aggregate supply, while the Tarr Inlet area is

a potential medium-term option for aggregate supply. The remaining gravel deposits within the Niaqunguk River Valley are small sandy gravel deposits occurring as gravel bars along the river course and may have potential to meet aggregate short-term demands, although the amount of gravel material required to construct a road to this area probably make these deposits uneconomical. Deposits adjacent to the Sylvia Grinnell River are composed of good gravel and sand in varying amounts, however the quantities of gravel are not as abundant or clean as compared to the Northwest area, and the area would be environmentally sensitive. The Northeast Area within the Burton River Valley contains varying amounts of sand and gravel, although sand is inferred to be more abundant than gravel.

SURFICIAL GEOLOGY OF THE WRIGLEY AREA, MACKENZIE VALLEY, NWT

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The Geological Survey of Canada is collecting information on bedrock, surficial deposits and geomorphic processes along a proposed gas pipeline route in the Mackenzie River valley, NWT. As part of the Northern Energy Development Mackenzie Valley Project, we are examining the surficial geology to improve our understanding of the geomorphic history, groundwater, aggregate potential and slope stability in the Wrigley area. The modern landscape is the product of complex geological processes operating over tens of millions of years. Rivers, glaciers and landslides have extensively eroded folded and thrust-faulted sedimentary rocks of Proterozoic, Paleozoic and Mesozoic ages (>600 Ma to 65 Ma) during the Cenozoic (65 Ma to present). Surficial deposits observed during the 2005 field season date from the Late Wisconsinan glaciation (>30 to 10 ka) to the Holocene (10 ka to present). Benchmark observations and stereo-pair air photographs are used to provide a datum of terrain, landforms and geomorphic processes. Geoscience data are depicted on a surficial geology map as groups of letters and on-site symbols, arranged so that their positions represent terrain characteristics. Information includes texture, type of surficial material, surface expression, geomorphic processes and qualifiers. A schematic cross-section through the map area provides insight into the chronostratigraphic relationship of the various terrain units. The oldest surficial deposits are gravels and sands deposited in front of advancing ice margins by an east- to northeast-flowing river system occupying the Mackenzie Valley. At its maximum extent (ca. 30 to 18 ka), the Laurentide Ice Sheet flowed northwest across the Wrigley area, eroding pre-glacial sediments and bedrock, and depositing a clay-rich, matrix-supported till containing granite clasts from the Canadian Shield. During deglaciation, retreating ice and outwash blocked drainage, and an interconnected system of proglacial lakes formed in unglaciated valleys. An abrupt transition from till to glaciolacustrine deposits represents the extension of glacial lakes Mackenzie and McConnell into the Wrigley area after 11.5 ka. Lake sediments graded between approximately 230 m to 210 m are correlated with the middle glacial lake Mackenzie phase (ca. 11.0 to 10.7 ka). Lake sediments and coarse outwash related to the late glacial lake Mackenzie phase (ca. 10.7 to 10.5 ka) are graded to a minimum

elevation of 160 m. Outwash exposed at borrow pits in Wrigley, and along the Mackenzie River and its tributaries were deposited as fan-deltas that prograded north-east across the valley. These deposits are incised by a spillway that drained NW, parallel to the present course of Mackenzie River. The spillway and outwash (graded from 120 m to 110 m) are associated with a meltwater drainage route for glacial lake McConnell, ca. 10.0 ka. After 9.0 ka, eolian, fluvial and colluvial processes reworked glacial lake deposits, outwash and till, giving rise to the modern landscape.

BEDROCK GEOLOGY AND REGIONAL SYNTHESIS, PARTS OF HEARNE DOMAIN, NUNAVUT, CANADA

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This 1:250 000 scale bedrock geology map is compiled from several previously released, independent, map compilations. It is produced under the auspices of the Western Churchill Metallogeny Project (WCMP*), Northern Resources Development Program (2003-2007)* of the Earth Sciences Sector, Natural Resources Canada, and addresses one of the *priority issues* of the Earth Sciences Sector - *Development of the North*. This compilation presents an integrated geological and metallogenic synthesis of the principal lithotectonic elements of a metal-rich portion of the Western Churchill Province, and provides an improved tectonostratigraphic framework for resource exploration and development. The area, covered in this compilation, represents a significant portion of the Hearne domain.

Northwestern Hearne

This region is broadly divided into four lithological and structural subdomains:

- The MacQuoid Homocline principally composed of Archean amphibolite facies sedimentary rocks (As) and gneissic tonalite (At), structurally overlain by;
- A volcanic belt comprising ca. 2720-2655 Ma, amphibolite facies juvenile mafic, intermediate, and felsic volcanic rocks(Av, Af, Amu') and associated ca. 2784-2655 Ma plutonic rocks (Adt, Ag);
- ca. 2700 Ma Cross Bay plutonic complex comprising polydeformed and metamorphosed Archean tonalite gneiss (AtCB), diorite (Adi), and gabbro (A'gb) that structurally overlies the MacQuoid Homocline, and by;
- A segment of the intracontinental, Baker Lake Basin comprising Paleoproterozoic continental clastic and intercalated volcanic rocks of the Dubawnt Super Group (Pblg-Pbg; ca. 1850-1700 Ma).

U-Pb isotopic studies suggest that the Cross Bay complex was deformed at ca. 2695 Ma before the onset of ca. 2680 Ma volcanism in the MacQuoid homocline, and highlight a complex Archean to Paleoproterozoic tectono-magmatic evolution. Metamorphosed and deformed ca. 2190 Ma mafic dykes (Pd), and variably deformed ca. 1830 Ma granite (Pg, Pgd, Pgr) and co-

magmatic lamprophyre dykes (Pdl) represent Paleoproterozoic magmatic events. The region experienced widespread regional metamorphic events at ca. 2.55-2.5, 1.9, 1.83, and 1.75 Ga.

Central Hearne

- This region is underlain by the central- and eastern-segments of the Archean Ennadai-Rankin Inlet granite-greenstone belt (Av-Act; Heninga, Kaminak,Tavani, and Rankin Inlet segments), Paleoproterozoic continental clastic cover-sequences with minor volcanic rocks (e.g., Hurwitz Group, Pn-Pu)), and by ca. 1830 Ma granitoid plutons (Pg).
- Geochronological data indicate formation of the Archean crust between 2711-2667 Ma. The oldest volcanic rocks (2711-2691 Ma) consist of mixed tholeiitic and calc-alkaline mafic and felsic, submarine to subaerial volcanic rocks and associated plutons. Younger volcanic rocks and associated calc-alkaline intrusions yield ages between 2686-2679 Ma. A regional, penetrative deformation and metamorphism occurred during the latter stages of a plutonic event at ca. 2680 Ma.
- Detrital zircon geochronology indicate that the Archean metasedimentary rocks and associated iron formation were deposited after 2681 Ma followed by ca. 2666 Ma post-tectonic granite, ca. 2659 Ma carbonatite, and deposition of post-2660 Ma, possible "Timiskaming-type" conglomerates.
- Development of the Rankin-Ennadai belt in an extensional, oceanic supra-subduction environment.

Metallogeny

The Western Churchill Province is host to a variety of mineral prospects/deposit types including lode gold, magmatic sulphides with Ni-Cu-PGEs, volcanic-associated massive sulphide, diamonds, carving-stone, and uranium. Active diamond exploration is currently being undertaken in the northwestern Hearne and in the adjoining Rae domain where several subsurface kimberlites have been identified. The metal endowment and styles of mineralization in the central Hearne domain are consistent with concentration of base metals and at least some gold during arc-related volcanism and associated plutonism in the Archean. The northwestern Hearne domain and the adjoining Rae domain have been affected by protracted tectonothermal reworking events during the Paleoproterozoic and appear to have influenced localization of gold mineralization in the Archean. However, the extent of the Proterozoic gold metallotect in the region is not well defined at present.

A LITHOFACIES-CONSTRAINED STRUCTURAL CONTROL ON MINERALISATION AT THE GAYNA RIVER ZN-PB DEPOSIT, MACKENZIE MOUNTAINS NWT

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The Zn-Pb deposit at Gayna River, NWT is hosted by Neoproterozoic (ca. 880 Ma) carbonate rocks of the Little Dal Gp. (Mackenzie Mountains Supergroup). The mineralisation has been

radiometrically dated as middle Paleozoic in age (R. Sharp, pers. comm., 2005). Previous work has demonstrated that the bulk of known mineralisation is within two stratigraphic units, informally designated the lower and upper host units. These correspond to the uppermost part of the basinal assemblage and the lower part of the overlying grainstone formation in informal GSC terminology. Surface exposures and data from drilling conducted in the 1970s indicate that the mineralisation is spatially associated with giant microbial reefs (>500 m thick; kilometres in diameter) that are part of the basinal assemblage, but the reason for this relationship has never been explained.

The Gayna River property is on the southwestern flank of a large, northwest-trending gentle antiform, where the present-day erosion surface cuts through the unconformity that separates Neoproterozoic and Cambrian carbonate rocks. Although cliffs north of the main showings expose the full stratigraphic extent of the basinal assemblage and grainstone formation, these outcrops are at some distance from mapped reef margins.

Previous work has demonstrated a complex interplay between reef growth, reef-margin deposits, and off-reef sedimentation patterns. The topographic relief and areal extent of the reefs varied dramatically through time, as relative sea-level and off-reef sedimentation rates and compositions changed. The final geometry of the homogeneous, unbedded reef masses, within the enclosing, layered strata of the basinal assemblage and grainstone formation, is critical to localising fluid flow during the much later mineralising event.

The final phases of reef growth included an interval of rising sea-level, which resulted in steep reef margins and a large amount of paleotopographic relief, followed by a final relative sea-level fall, which yielded strikingly flat, erosional reef tops. The junction of these two surfaces forms a sharp corner at all reef-top margins. Such reef-top margin inflection points formed zone where movement of the more inhomogeneous, mobile, layered off-reef strata against the rigid, massive reef units was focused both during burial compaction, and, likely, during later compressional tectonism in the Paleozoic. Brittle deformation of the carbonate units in response to these stresses is, therefore, localised to haloes around reef-top margins. The resulting fracture systems were subsequently filled by Zn-Pb sulphides.

Zn-Pb mineralisation is known from the Gayna River area because reef-top margins are exposed there. It is unknown from other regions where the same stratigraphic units are exposed, because those areas lack reefs. Further mineralisation could be present in the subsurface to the northeast, where reef distribution patterns suggest that buried reefs are likely present. Known reefs to the east and southeast are too deeply exhumed by recent erosion to have preserved reef-top margins. Strata at the margins of reef bases are less likely to host mineralisation because reef-base margins are not angular, and early reef stages are associated with predominantly shaly units that would have responded more ductilely to burial and tectonic stresses.

GEOTECHNICAL STUDIES OF PERMAFROST-RELATED LANDSLIDES IN THE MACKENZIE VALLEY, NWT

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Landslides are commonly encountered in the Mackenzie Valley, Northwest Territories, especially in the areas where trees and vegetation have been burned by forest fire. Recently renewed interest from the energy sector in oil and gas development in the Mackenzie Valley has emphasized the need for improved understanding of landslides in the region. In response to this need, a research project was initiated at the Geological Survey of Canada to carry out geotechnical studies on landslides in the region. As part of the research project, initial geotechnical site investigations were conducted in the northern part of the Mackenzie Valley in the summer of 2005. An area south of Richards Island about 750 km long and about 20 km wide was visually inspected from the air via helicopter and on the ground. Test pits were excavated with shovels around some landslides to investigate subsurface soil conditions and to collect soil samples for laboratory testing. The test pits were excavated to depths ranging from 0.5 m to 1.4 m, and were limited by the depth of frozen soils. Field vane shear tests were conducted to determine the shear strength of the thawed soils in the active layer. The presentation summarizes the data collected from the initial field program. Characteristics of the landslides are described, e.g., locations and orientations of the slides, slope and slide geometries, landslide flow phenomena, evidence of surface active layers, and rate of head scarp surface ablation. Observations of the ground surface and subsurface soil conditions, as well as soil strength parameters, are described in relation to the landslides. Analyses are being conducted based on the initial data collected to evaluate factors contributing to the landslides. Further site investigation is also planned.

USING TOPOGRAPHIC LIDAR TO PREDICT COASTAL FLOOD EXTENT AND MAGNITUDE IN THE BEAUFORT-MACKENZIE REGION, NWT AND YUKON

Whalen, D., Solomon, S., Strang, J., Forbes, D.L., and Manson, G.K.
See Talks

GEOSCIENCE EDUCATION IN BRITISH COLUMBIA: WHERE IS IT GOING?

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The formal introduction of hands on geoscience education began with a major curriculum revision in 1968 in which surface processes were covered in grade 8 Science, Astronomy in Science 9 and internal processes in Science 10. These curriculum topics were mandatory although by the time I started teaching in 1970 there was already a culture of "we do not have to teach those" The traditional physics, chemistry and biology were the dominant areas that had to be taught and forget about learning something about this planet we call home. During the early 1970's British Columbia introduced Earth Science 11 and Geology 12, become leaders in Canada in terms of geoscience education

In the early 1980's the next curriculum revision again emphasized the traditional topics while much of the geoscience was fragmented and declared optional. Needless to say, very little geoscience was taught except by a small band of teachers who recognized its importance.

In 1995 the first prescribed Elementary Science curriculum was introduced with a significant coverage of age appropriate geoscience concepts. Up until this point geoscience education was very hit and miss with dinosaurs being a hit and just about everything else being a miss. 1996 saw the introduction of a new Junior Science curriculum in which all the traditional earth and space science topics were consolidated and made compulsory. However they were still ignored by far too many science teachers. When a mandatory Science 10 exam was introduced in 2003 one of the biggest complaints centred on having to teach the geoscience unit.

In 2004 there came a major curriculum revision in Elementary Science in which most of the geoscience was concentrated in Science 7. Not only did the curriculum include bad science it also prescribed a curriculum that was far too large for the time available. The cognitive level of the concepts is beyond the ability of students of that age, leading to curriculum that has degenerated into low-level rote learning. The proposed textbooks are simplistic and have serious errors in science. Curriculum revision of Science 8-10 was released in June 2005 and here again we see a degeneration and fragmentation of the geoscience components, justified by a partial alignment with the Pan-Canadian Curriculum Framework.

This presentation will illustrate in more detail these curriculum revisions and hopefully stir the geoscience community to become more aware of the issues facing the teaching of the geosciences in the K – 12 education system. When one looks at the number of deaths and property damage attributable to natural events just in the last 12 months, why are we being so complacent about the geosciences? Continued ignorance and stupidity will continue the cycle of death and destruction.

A DISTAL EXPRESSION OF A PROTRACTED SKARN-FORMING EVENT? : OXYGEN ISOTOPE AND FLUID INCLUSION STUDIES OF QUARTZ-SCHEELITE VEINS IN THE CANTUNG MINE, NWT

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High-grade quartz-scheelite veins in the open-pit orebody of the Cantung mine, Tungsten, NWT occur 500 m vertically above a Cambrian limestone-Cretaceous monzogranite contact along which the E-Zone, a world-class tungsten skarn orebody, is developed. The trend of the veins is roughly parallel to the strike and dip of a near-vertical aplite dike along the pit's edge. Oxygen isotope values for vein-hosted quartz and scheelite range from 9.9 to 13.1‰ and 6.6 to 7.5‰, respectively, yielding equilibrium depositional temperatures of 430 to 560°C. These temperatures suggest that the high-grade quartz-scheelite veins in the open pit are a late magmatic-hydrothermal feature of a protracted skarn mineralizing event, perhaps related to aplite dike emplacement.

Analysis of >500 fluid inclusions in quartz, scheelite, and tourmaline from veins and aplite dikes reveals that ore fluids in the open-pit and underground skarn orebodies are grossly similar H_2O-CO_2-NaCl±CH_4 fluids. However, plots of T_h of CO_2 vs. T_m of CO_2 and T_h total vs. salinity reveal distinct end-member fluids for skarn- and aplite-hosted inclusions. High-grade quartz-scheelite veins from the open pit contain components of both fluid types. We interpret the fluid inclusion, oxygen isotope and structural data to indicate that high-grade quartz-scheelite veins in the open pit represent a distal skarn-forming event in which deeply derived skarn fluids, like those observed at the subjacent granite-limestone contact, interacted with aplite-related fluids.

We envision a conceptual model for the Cantung hydrothermal system in which ore-grade tungsten deposits formed where fluids emerged from the granite and encountered rocks favorable for skarn development (e.g. cleaner 'Ore Limestone' versus cherty 'Swiss Cheese Limestone'). Due to the folded geometry of the sedimentary sequence, in other areas along the granite contact the fluids emerging from the granite encountered strata less favorable to skarn development (i.e. argillite). Where these less favorable units were breached by fracture systems, potential skarn-forming fluids (and aplite dikes) gained access to host rocks more conducive to ore development vertically distal to the granite contact.

The documentation of ore-mineralizing fluids distal to the intrusion-country rock contact expands the potential exploration area for tungsten ore targets. Distal exploration targets need not be manifested as massive skarns, but could take on various forms depending on the geometry and chemistry of the host lithologies. Vein and replacement-type deposits in metasedimentary rocks of the Tungsten region frequently have been assumed to represent older ore events. Their origins should be re-evaluated, as some of them could instead represent distal, granite-related deposits.