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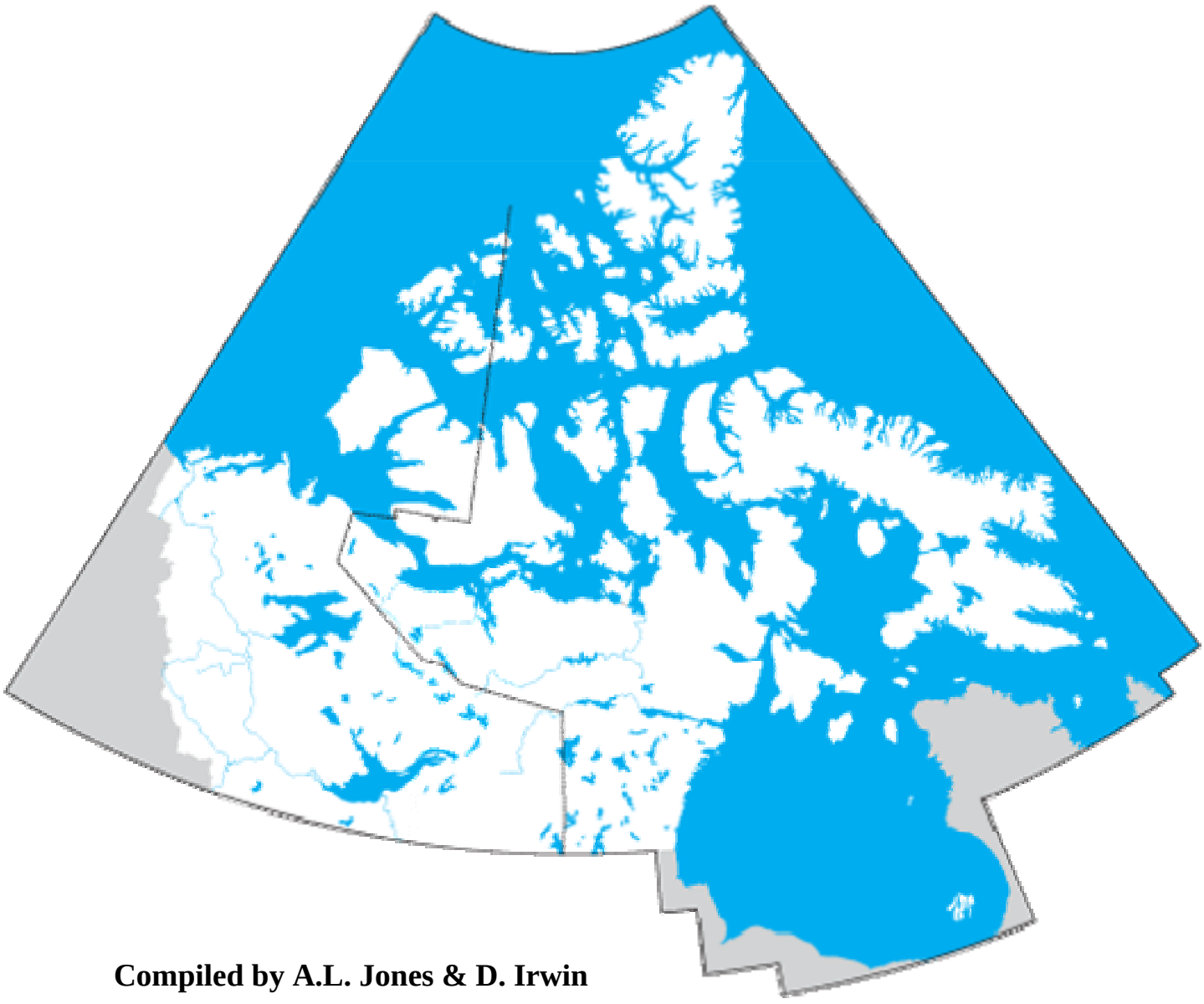

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Note: This publication does not include the abstracts of all Forum presentations and posters. The compilers have sought to include as many abstracts as possible; but in some cases, abstracts were not submitted.

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TALKS

THE MOUNTAIN LAKE SANDSTONE-HOSTED URANIUM DEPOSIT, PROTEROZOIC HORNBY BAY BASIN, NUNAVUT

Armitage, A.
Triex Minerals Corporation

Exploration in the Hornby Bay Basin from 1969 to 1981 resulted in the discovery of the Mountain Lake uranium deposit and other significant uranium occurrences. Triex Minerals Corporation and 50:50 joint venture partner Pitchstone Exploration Ltd. explored for uranium in the basin during 2005 and 2006. The joint venture land holdings total ~221,000 ha, and include the Mountain Lake Deposit. This deposit is located about 550 km. north of Yellowknife, NWT and 100 km. southwest of Kugluktuk, Nunavut.

The Hornby Bay Basin is composed of Lower to Middle Proterozoic (ca 1.6 Ga) clastic-carbonate sedimentary rocks subdivided into the lower Hornby Bay Group and the upper Dismal Lakes Group. These rocks unconformably overlie Lower Proterozoic (ca 1.95 – 1.84 Ga) granitic and metasedimentary rocks of the Wopmay Oregen.

The Mountain Lake Deposit is the largest known uranium occurrence in the Hornby Bay Basin. The deposit is tabular, stratabound and hosted within gently (5 - 10°) northeasterly dipping silicified sandstone and conglomerate of the Dismal Lakes Group. The 320 m wide by 1300 m long deposit extends from near surface to a depth of 136 m. It is situated within a northeast-trending graben bounded by the steeply dipping Aquitaine and Imperial faults. Disseminated uranium oxides grading 0.1-0.4% U_3O_8 occur in several horizons 1-6 m thick within a lower grade (0.05-0.1% U_3O_8) envelope up to 30 m thick. Fracture-controlled uranium oxides locally grade up to 5.19% U_3O_8.

The Mountain Lake Deposit is estimated to contain an Inferred Resource of 3,700 tonnes of U_3O_8, within 1.6 million tonnes of mineralized rock, at an average grade of 0.23% U_3O_8 (N.I. 43-101 compliant). This is based on a minimum grade of 0.10% U_3O_8 and a minimum vertical thickness of 1.0 m.

Twenty diamond drill holes totaling 3100 meters were completed within and peripheral to the Mountain Lake deposit in 2006. Drilling confirmed the uranium mineralization within the main deposit, and extended it to the southwest. A new zone of anomalous radioactivity discovered at Jenny Lake underscores the potential for additional uranium deposits on the property.

The Dismal Lake West project area is 40 km northwest of the Mountain Lake deposit. Previous work here resulted in the discovery of more than 450 radioactive sandstone boulders within an area approximately 4 km long by 1.5 km wide. A glacial till study that focused on glacial transport indicators for the boulder field defined a probable bedrock source area to the east. The Kendall River Project area is located 25 km southeast of the Mountain Lake Deposit. A total of 145 radioactive boulders here form a tightly delineated northeasterly trending train 3,400 m long

and up to 230 m wide. A northeasterly trending, regional fault parallels the Kendall River boulder train. The source of the boulders in both the Dismal Lakes West and Kendall River areas is likely the same Dismal Lakes Group sandstone unit that hosts the Mountain Lake Deposit.

Airborne radiometric surveying, and geological mapping, prospecting geophysics and geochemistry were completed on the Dismal Lake West and Kendall River project areas in 2006; these targets will be drill-tested during the spring of 2007.

BEAUFORT SHELF SEABED FEATURES AND PROCESSES: IMPACTS ON THE ENVIRONMENT AND OFFSHORE DEVELOPMENT

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(3) Canadian Hydrographic Service, Burlington, ON

In August-September-October 2006, the Geological Survey of Canada in collaboration with the Canadian Hydrographic Service and ArcticNet conducted seabed mapping programs from the Canadian Coast Guard vessels Nahidik and Amundsen. Research in the Beaufort Sea has been focused on investigating geohazards and engineering issues related to offshore hydrocarbon exploration and transportation (i.e. ice scour, seafloor instability, shallow gas, etc.) Also, through the Ocean Action Plan, a 1 km wide transect across the Beaufort Shelf was mapped to assess geological influence on benthic ecosystems. Multibeam sonar, sub-bottom profilers, sediment corers (box and gravity), side scan sonar, and seismic reflection profilers were used to investigate the seabed of this region.

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, was remapped with a multibeam echosounder in 2004 and 2006. This new data has been acquired to gain a better understanding of the age of the slump feature. Multibeam data was collected along a 1 km wide transect across the Beaufort Shelf on the eastern side of the MacKenzie Trough. The multibeam data will be used in conjunction with ground truth data to study the benthic ecosystem across the entire transect from 5 to 400 m water depth as a scientific contribution to the assessment of ecologically and biologically significant areas.

New ice scour occurrences on the seabed were determined using repetitive mapping techniques involving side scan sonar and multibeam echosounder data. Active ice scouring by the present sea ice regime is observed to 55-60 m water depth. The new 2006 ice scour data will be added to the Beaufort Sea Ice Scour database and will be used for determining the return period of extreme scour events on the Beaufort Shelf. Digital multichannel seismic reflection data was collected in order to image shallow gas and permafrost in sediments at depths greater than 20 m

below the seabed. Core samples were acquired to study the variability in physical properties of seabed sediments due to the ice scouring process. Even 20 years after abandonment, artificial drilling islands from the 1970's and 80's are still actively eroding and migrating to the southeast.

FERTILIZING THE GROUND FOR IOCG MINERALIZING SYSTEMS: EVIDENCE FROM LAM ICP-MS ZIRCON U-PB GEOCHRONOLOGY IN THE GREAT BEAR MAGMATIC ZONE, WOPMAY OROGEN, NWT

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(2) Natural Resources Canada, Geological Survey of Canada, Québec
(3) Northwest Territories Geoscience Office, Yellowknife, NT

The De Vries Lake area, southern Great Bear Magmatic Zone (GBMZ), hosts pre-, syn- and post-deformation IOCG-type alteration in folded and foliated metasedimentary rocks of the Treasure Lake Group (1.88 Ga maximum age) as well as post-deformation alteration in volcanic rocks associated with the Great Bear Magmatic Arc (1.88–1.85 Ga). A detailed LAM ICP-MS zircon U-Pb study to determine crystallization ages of intrusive rocks emplaced in the Treasure Lake Group demonstrates that fluid activity responsible for extensive alteration and local mineralization started prior to intrusion of the voluminous ~1.87–1.86 Ga magmatism in the GBMZ (e.g. Marian River Batholith). Lit-par-lit sodic (albite), calcic (Ca amphibole) and iron (magnetite) alteration is early and followed by potassic (alkali feldspar), iron (magnetite) and propylitic (epidote) lit-par-lit to vein-type alteration associated with brecciation, injection of granitic veins, and sulphide mineralization. Granitic dykes and veins crosscut folded metasedimentary rocks hosting early lit-par-lit alteration. In detail, dykes and veins parallel to foliation display pinch-and-swell structures without megascopic evidence of recrystallization, whereas those oblique to foliation are folded and display thickening parallel to the extension direction in mechanically competent amphibole-rich (calcic alteration) layers and ptygmatic folding in more ductile layers, implying syntectonic emplacement. No clear timing relationships were observed between the dykes and the magnetite alteration that occurs in association with unusual breccia and granitic veins, but a broadly coeval relationship is suspected. Zircon extracted from a granite dyke show a range of morphologies, including prismatic shapes with oscillatory and weak sector zoning locally overprinted by recrystallized patchy domains and thin overgrowths. A concordia age of 1878±4 Ma is interpreted as a crystallization age, thereby constraining the timing of calcic alteration to pre-ca. 1878 Ma. A widespread foliated pink porphyry unit in the De Vries Lake region is extensively overprinted by late-stage potassic veins which contribute to its distinctive pink hue. Zircon extracted from this unit are subround to prismatic and locally display weak, diffuse oscillatory zoning implying they have undergone variable degrees of recrystallization. They yielded an age of 1877±3 Ma interpreted as the age of crystallization. An alkali feldspar – hornblende granite crosscuts three phases of alteration (calcic, sodic and magnetite) that have affected a porphyritic host and is itself overprinted by two alteration phases (propylitic and potassic) and a suite of aplitic dykes. The 1874±3 Ma crystallization age of the granite places a minimum age constraint on the calcic-sodic-iron

alteration event; this is also supported by relationships from an 1872± 4 Ma diorite. A representative of the suite of aplite dykes, which postdate all magmatic and most alteration events in the area apart from pervasive late stage potassic alteration, has yielded a crystallization age of 1866±5 Ma. Finally an extensive body of 1860±4 Ma rapakivi granite intrudes altered metasedimentary rocks of the Treasure Lake Group north of De Vries Lake. Collectively, these data indicate that at De Vries Lake there was significant fluid activity and IOCG-type alteration prior to the main phase of magmatic activity within the GBMZ.

CAMBRIAN FIELD RECONNAISSANCE IN THE MACKENZIE VALLEY

Bergquist, C.L. and Turner, J.
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Devon Canada and Talisman Energy have been involved with extensive field reconnaissance mapping of the Proterozoic and Cambrian sections in the Mackenzie Valley for the past two years. The work has focused on the central Mackenzie Mountains, but has also encompassed the McConnell Mountains and the area to the northeast of the Dease Arm, Great Bear Lake. This work has been part of an ongoing regional Cambrian evaluation, as well as a sub-set of the current NTGO Peel Plain regional assessment.

The fieldwork was accomplished over a total of 7 weeks during 4 different field parties in 2005 and 2006, and included participants from Devon and Talisman, as well as the GSC and NTGO. The joint teams visited GSC type sections and additional outcrops of relevance to the project. Primary objectives of the fieldwork were to identify potential Cambrian reservoirs, Cambrian and Proterozoic source intervals and to re-examine regional Cambrian stratigraphy and tectonics. Although work is still ongoing, substantial progress has been made in our understanding of the Central Mackenzie Valley's Cambrian, including significant variations observed from previously published literature.

Fieldwork was helicopter-supported daily and included evaluation of 35 sections and the collection and analysis of over 750 field samples. Extensive laboratory analysis of these samples is still in-process. This talk will provide an overview of these studies and discuss several of the structural, stratigraphic and source rock findings to-date.

ASSESSING CHANGES IN TERRESTRIAL ECOSYSTEM DISTRIBUTION AND COMPOSITION DUE TO RECENT CLIMATIC CHANGES, PERMAFROST THAWING, WILDFIRE AND HUMAN IMPACTS IN THE MACKENZIE VALLEY REGION, NWT

Bhatti, J., Brady, M. and Errington, R.
Natural Resources Canada - Canadian Forest Service, Edmonton, AB

The Mackenzie Valley region of northwestern Canada has undergone the most warming (1.7^{o}C) over the last century in Canada. In the event of such climate change, different ecosystems in the Mackenzie valley region will also be affected by changes in the key disturbance regimes of permafrost and wildfire. It is uncertain how the above mentioned changes will affect the distribution and composition of vegetation in forest and peatland ecosystems. Because of the relatively large changes in climate and associated disturbances occurring in this region, in 2006 Natural Resources Canada - Canadian Forest Service in collaboration with the Government of the Northwest territories initiated a three-year study to improve our understanding of the potential effects of recent climate change, as well as natural and anthropogenic disturbances, on vulnerability and sensitivity of different ecosystems in the Mackenzie valley region.

The objective of the study is to develop methods to map and assess possible changes in the distribution and composition of forest and peatland ecosystems across the regional gradient due to recent climate change, permafrost thawing, wildfire and human impacts. The results and information generated by the study are essential for the sustainable development of Canada's northern oil and gas development by helping to reduce uncertainties in the projections of global change and estimating its consequences in Canadian northern ecosystems. In particular, such understanding will support better mitigation of the effects of the Mackenzie Valley Gas Project. Vegetation change, in turn, leads to faunal change, possibly affecting distribution and viability of wildlife populations and sustainability of native communities. In addition, the study results will help to establish a sound scientific basis for a number of the recommended Criteria and Indicators for sustainable management. The study will also provide methodological approaches for the estimation and monitoring of these indicators. This should help to guide both regional and national policy decisions.

MINING IN THE CONTINUOUS PERMAFROST: CONSTRUCTION AND INSTRUMENTATION OF TWO LARGE-SCALE WASTE ROCK PILES

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Diamonds have led to a dramatic increase in mining in the continuous permafrost region of Canada's North over the past decade. At the Diavik Diamond Mine Inc. operation, open pit mining will lead to the construction of two 200 Mt permanent stockpiles of waste rock. A rigorous framework for assessing the long-term environmental implications of storing waste rock in regions with continuous permafrost has yet to be developed. This study involves the construction of two large-scale waste rock piles (15 m in height x 60 m x 50 m) to assess the evolution of the hydrology, geochemistry, temperature, gas transport, and biogeochemistry of the waste rock piles over time. One test pile will contain rock with a sulfide content of < 0.04 wt% S and the other test pile contains rock with > 0.08 wt% S. Complementary studies involving conventional static and kinetic tests on small test samples have also been initiated. The results from this five-year study will assist mining companies and regulators in evaluating current waste rock pile designs. This paper describes the construction of test piles, and additional testing planned to quantify the relationship between weathering rates in laboratory dissolution tests and those in waste rock piles in the field.

TAMERLANE VENTURES

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The Pine Point Mine was shut down in 1987 after mining 68 million tonnes grading 3.1% lead and 7.0% zinc from 52 deposits (value of $20 billion at $0.64/lb lead and $1.60/lb zinc). A total of 35 delineated deposits remain un-mined including several deposits drilled off by Westmin Resources.

Current lead and zinc prices have created renewed interest in these deposits and Tamerlane Ventures Inc. is currently conducting a feasibility study on the R-190 deposit then will test mine the deposit to prove the technologies that are necessary to mine the remaining deposits underground. The technologies to be used include underground mining using a shaft access located within a freeze ring to control the water influx to the mine plus the use of a vertical, in-

shaft conveyor. Dense media separation will be tested to upgrade the ore to a bulk concentrate grade.

Freeze ring technology, which was selected to control the water within the aquifer that hosts the deposits, will prevent water flow laterally through the aquifer. Vertical water flow from the bottom of the mine will be minor as the freeze ring will bottom in the E facies of the Pine Point Fm. which is a relatively non porous dolomite. Leakage into the mining area will be controlled by normal mine pumping.

Concurrently with the R-190 feasibility Tamerlane has proceeded with permitting the test mine. Tamerlane expects to have the permitting work for a class A permit completed by early spring 2007 and to commence work on the freeze ring drilling soon thereafter.

The geology and mineralization at Pine Point are typical of Mississippi Valley type deposits. The host Pine Point Formation is an east-west striking middle Devonian barrier reef that separated the open sea to the north from a large evaporite basin to the south. The reef lies on or very close to the McDonald fault, which is a dextral strike slip fault of continental scale that separates the Slave Province from the Churchill Province.

The mineralization is localized in paleo-karst caverns and underground streams formed within the reefal limestone when the reef was exposed above sea level. The main trend and the north trend of ore deposits are very distinct but a third trend, called the south trend is more erratic. All of the trends strike NE along the long axis of the reef and are included within a vast coarse dolomite alteration zone called the Presquile. The Presquile alteration is very similar to that found in many oil and gas fields. The karst caverns which host the lead-zinc deposits were likely oil traps at one time as large amounts of bitumen are often found at the top of the ore. Ores are thought to have formed by the mixing of metal rich brines derived from the dewatering of shales flanking the north side of the reef with sulphur rich waters from the evaporites south of the reef.

Tamerlane plans to commence construction in 2007 and produce at a rate of 2,800 tonnes per day in 2008.

SNAP LAKE DIAMOND PROJECT EXTRACTION PLANNING

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The Snap Lake diamond project, located 220 kilometers north east of Yellowknife, is currently in the second year of construction with planned commissioning for September 2007. By this time, underground development and surface facilities will be sufficient to begin production, ramping up to an operating throughput of 3150 tonnes per day. Defined and mineable reserves, by

drifting and bore-hole radar, are targeted at 18 months ahead of production, which will migrate to two years further in the life of mine.

The planned mining method is room and pillar. The key parameter for success at Snap Lake will be dilution control in the mining block. The impact of dilution will increase costs significantly on a per unit basis and has the potential for reducing recoveries in the mill. The exact parameters for recovery impacts in the mill are not known until the project begins to collect data under operating tonnages. Thus far, the project has relied on company wide experience to give direction to the costing models.

The minimum mining height currently used in our planning scenarios is 3.1 meters. The kimberlite dyke is variable within (and at times outside) the 3.1 meter envelope. When mining, the producing faces will be incurring some level of dilution on primary extraction. Planned dilution will be significantly reduced in the secondary and tertiary extraction phases via greater knowledge of the hangingwall and footwall contacts. The other benefit of maximizing the secondary and tertiary extraction sequences is increased overall productivity underground. The project team will be running arena simulations to quantify the bottlenecks in the planned system and where gains could be maximized to increase IRR.

AN INTRODUCTION AND UPDATE TO THE 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.

In January, 2006 INAC released an updated version of The Mine Site Reclamation Guidelines that complements the 2002 Mine Site Reclamation Policy for the Northwest Territories. These guidelines were developed in consultation with Aboriginal community members, scientific experts, mine representatives, regulatory authorities, and other affected parties.

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 the 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. Sections are broken

down to discuss major mine reclamation issues and to specifically address individual mine components.

Comments received during the consultation process addressed the need for these guidelines to maintain their currency and effectiveness; this included accounting for ongoing operational, political, legislative and technological developments related to mine site reclamation. To this end, Indian and Northern Affairs Canada, NWT region will update these Guidelines annually. All comments and suggestions and encouraged and will be considered in the process with each new version being made available to the public at the start of each New Year.

To obtain copies of the 2006 version of the Mine Site Reclamation Guidelines please contact:

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THE MACKENZIE GAS PROJECT: A GOVERNMENT OF THE NORTHWEST TERRITORIES OVERVIEW

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The dream of connecting stranded Northern natural gas reserves with existing pipeline systems in southern Canada has been alive for decades. The most recent proposal by a consortium of companies led by Imperial Oil Resources Venture Limited requires the development of three anchor fields north of Inuvik (which contain 6 trillion cubic feet of proven reserves), 190 km of gathering lines to bring the gas to the processing facility near Inuvik, 1,200 km of 30-inch gas pipeline from the processing facility to the Alberta border and 457 km of 10-inch natural gas liquid (NGL) pipeline from Inuvik to Norman Wells.

Turning the Mackenzie Valley Pipeline into a reality has been a long journey, one that is by no means complete. The Government of the Northwest Territories wants to see the project proceed in a way that is sustainable environmentally, socially, culturally and economically. Currently, the proposed Project is undergoing thorough technical and environmental reviews by the National Energy Board and the Joint Review Panel. The Government of the Northwest Territories believes the Mackenzie Gas Project is an important development in securing a sound financial future for the residents of the Northwest Territories.

IRON OXIDE COPPER-GOLD DEPOSITS: A CANADIAN PERSPECTIVE AS INTRODUCTORY REMARKS TO THE SPECIAL SESSION

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Iron oxide Cu-Au (U, Ag, Bi, Co, REE) deposits have recently emerged as a deposit-type of choice for exploration in Canada. These deposits encompass a wide spectrum of sulphide-deficient low-Ti magnetite and/or hematite ore bodies of hydrothermal origin with more than 20% iron oxides. Breccias, veins, disseminations and massive lenses with polymetallic enrichments are commonly associated with extensive volcano-plutonic events and crustal-scale structures that respectively drive and channel large-scale fluid flow into mid to upper crustal levels. Mixing of magmatic fluids with near surface meteoritic fluids or brines is commonly invoked. A-type granites or alkaline intrusions are considered important, though in some cases the magmatic source may be distal from the deposit. In ancient Proterozoic and Archean terranes, variable metamorphism can significantly modify observed mineralogy and textures, making identification difficult.

The Proterozoic continental arc and orogenic settings of IOCG deposits in the Canadian Shield and the Cordillera provide an important analogy with the setting of the 3.81 billion tonnes Olympic Dam deposit and other known IOCG deposits worldwide. Two IOCG deposits with measured resources occur in the Great Bear Magmatic Zone, Canada's premier emerging IOCG district: NICO and Sue-Dianne. A third one is Kwyjibo in the Grenville Province. Significant Cu–Au (U, REE) prospects and prospective targets are also known from 1) the Wernecke Breccias and the Iron Range in the Cordillera, 2) the Mid-Continent Rift system, 3) the Shebandowan belt and Rivière aux Feuilles district in the Superior Province, 4) the Nipigon Embayment, 5) the Reindeer Zone of the Trans-Hudson Orogen, 6) the Sudbury-Wanapitei area of the Southern Province, 7) the Killarney Magmatic Belt, the Disappointment Lake area and the Bondy Gneiss Complex in the Grenville Province, 8) the Central Mineral Belt in Labrador and 9) the Romanet horst in the Labrador Trough. Several of these settings host past-producing mines that are now recognized as polymetallic IOCG type deposits; others hosts uranium deposits or carbonatite intrusions that may point to IOCG potential. Phanerozoic settings of interest include the Mont de l'Aigle area, the Avalon zone, the Cobequid-Chedabucto Fault Zone, and the Lepreau Iron mine in the Appalachian orogen, and the Insular Range skarn and Heff deposits in the Cordillera.

Systematic geological properties allow IOCG deposits to be detected by geological, geochemical, remote sensing and geophysical techniques. New developments include hyperspectral data and Aster satellite images analysis, and predictive mineral potential mapping. However, a key problem in applying expert systems is often a lack of reliable and comprehensive geological data. Considering that IOCG settings are mostly in non-traditional exploration areas that remain significantly under-mapped, IOCG exploration requires good field geology and supporting modern geoscience, creative exploration methods, good case examples and innovative

genetic models. We hope that this special session will contribute to sustained exploration and development activities through the sharing of our collective experience and knowledge.

VECTORING CONCEPTS AND PRACTICAL GUIDES FOR IOCG-U EXPLORATION IN UNDEREXPLORED TERRANES: INSIGHTS FROM THE GREAT BEAR MAGMATIC ZONE

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Exploration for polymetallic iron oxide copper-gold (Co-Ag-Bi-U) (IOCG) deposits in Canada commonly takes place in underexplored, felsic to intermediate, volcano-plutonic belts that were mapped prior to the recognition of IOCG deposits in the 1990s. Consequently, key alteration zones are missing in available records, increasing risk to exploration. In parallel, the IOCG class of deposits is recognized as one of the most challenging fields of research in contemporary economic geology (P. Williams and colleagues in the Economic Geology 100th Anniversary Volume). One knowledge gap that is particularly critical to exploring for IOCG systems is field vectors to potential ore zones. The distribution and superimposition of diagnostic, intensive and extensive hydrothermal alteration that characterizes IOCG systems provides a means to understand processes that lead to ore deposition and refine exploration vectors that lead to ore.

Continuous exposures across IOCG deposit systems are required to decipher geological processes and guide data acquisition and research, a condition lacking in many key IOCG deposits where knowledge is mostly derived from drill core and underground workings. Newly recognized polymetallic IOCG systems in the Great Bear Magmatic Zone, Northwest Territories comprise stunning field exposures of intrusion-related alteration that provide clues to a great diversity of hydrothermal processes. The Contact Lake Belt, east of Great Bear Lake, displays overprinting of Cu-Au-Ag-U-Co-Bi-Zn mineralization on earlier iron oxide and regional-scale potassic and calcic-sodic alteration zones within multiple and sometimes superimposed hydrothermal centres. Strong potassic alteration is spatially associated with breccias including possible diatremes. Such alteration is spatially and genetically associated with vein, breccia and replacement styles of polymetallic sulphide minerals, and are largely hosted within porphyritic andesite in contact with sub-volcanic intrusions. Similar alteration types were also observed to the south in the DeVries and Fab lakes systems within earlier sedimentary rocks and syn-Great Bear Magmatic Zone volcanic rocks.

Pervasive texture-destructive sodic alteration zones are distal from mineralization at the contact with intrusive rocks. This alteration type also crops out as relict patches within extensive calcic-iron alteration zones. Magnetite-actinolite-apatite alteration is common as veins and/or pervasive zones both within albitite and associated with alkali alteration at considerable distance from the source intrusions. The nature of the hydrothermal overprint varies from one system to the other, ranging from textural pseudomorphing alteration to texture-destructive pegmatitic feldspar

(scapolite?)-magnetite-actinolite-apatite recrystallization. Sulphide minerals are most abundant where pervasive K-feldspar and iron alteration is spatially associated with incipient to severe breccia. Both magnetite, and pervasive earthy and/or specular hematite are present in this alteration phase. In earthy hematite zones, the potassic character may not be apparent megascopically. Alteration types that host uranium are characterized by distal hematite- and potassic-rich zones, however, the occurrence of uranium oxide minerals is not as predictable in the field as the copper sulphide zones.

REVISITING URANIUM IN NUNAVUT

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The resurgence of uranium exploration interest that began in 2004 in Nunavut continued throughout 2006. Strong commodity prices, predictions of a worldwide energy shortage, and an increasing gap between supply and demand are sustaining this latest exploration wave. Junior exploration companies and major mining companies are re-evaluating prospects, realizing Nunavut represents an under-explored frontier for uranium.

Most exploration plays are grassroots or greenfields prospects, focussing on unconformity-associated and sandstone-hosted models for Proterozoic basins. These plays are being driven by the occurrence of numerous prospects in geological settings similar to those of world-class deposits in the Athabasca Basin of Saskatchewan and basins in northwestern Australia.

Numerous occurrences are known in Nunavut's Proterozoic basins, with the Hornby Bay and Thelon basins being the hubs of exploration and the Baker Basin also attracting interest. Additionally there is exploration for Paleoplacer, vein, and volcanic uranium deposit types.

For 2006, over 460 claims in excess of 480,000 hectares have been staked to date. Twenty-six prospecting permits covering 380,439 hectares were awarded in February and cover favourable geological settings in the Kivalliq and Kitikmeot districts. There are more than 25 companies involved in uranium exploration in Nunavut and either directly hold land through prospecting permits and mineral claims or have partnerships and/or option agreements with other permit and claim holders.

DIAMONDIFEROUS PERIDOTITE MICROXENOLITHS FROM THE DIAVIK DIAMOND MINE: A CHALLENGE TO THE G10 PARADIGM IN DIAMOND EXPLORATION?

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For peridotitic diamond populations Gurney (1984) observed a direct link between diamond grade and evidence for highly depleted garnet harzburgite sources, establishing G10 garnets as the primary indicator mineral in diamond exploration. For the A154-South kimberlite at Diavik Diamond Mines we established a dominance of peridotitic sources based on both inclusions in diamonds (~83% peridotitic) and garnet xenocrysts (~96% peridotitic, adjusted for differences in modal garnet for peridotite and eclogite). Peridotitic garnet inclusions are mainly (82%) harzburgitic and there is a significant presence or G10 garnets in Diavik concentrate, suggesting that A154-South conforms to the G10 paradigm.

Recently, we obtained 21 diamond-bearing peridotitic microxenoliths from the A154-South kimberlite. Garnets from eight of the samples classify as G10 according to the classification scheme of Grütter et al. (2004), plotting close to the G10/G9 divide. Twelve of the garnets are classified as lherzolitic (G9) and one falls in the lherzolitic field on a Ca-Cr diagram but is classified as a G11 (high-TiO_2 peridotite). Despite the small number of samples, the low proportion of G10 garnets is remarkable and in stark contrast to the observations made on inclusions in diamond.

In order to maintain the concept of highly refractory harzburgitic diamond sources at Diavik, diamondiferous harzburgite xenoliths must be more friable than their lherzolitic counterparts. This seems an unlikely scenario. To reconcile a mainly harzburgitic diamond population with a predominantly lherzolitic paragenesis of diamondiferous microxenoliths, we propose that metasomatic re-enrichment resulted in the conversion of diamondiferous harzburgite to lherzolite. This may lead to lherzolite hosting originally harzburgitic diamonds. Nitrogen contents and aggregation states, and carbon isotopic compositions indicate that the diamonds from the microxenoliths are representative of the typical diamond source rocks beneath the Lac de Gras region. This implies that diamond sources at Diavik may be predominantly lherzolitic at the time of sampling by the kimberlite, presenting a challenge to the G10 paradigm.

References:

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DEVELOPING CANADA'S NEXT LARGE GOLD MINE: AN UPDATE ON 2006 ACTIVITIES, MEADOWBANK GOLD PROJECT, NU

Cumberland Resources Ltd.

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 4.0 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. A new zone of mineralization, the Cannu zone, was discovered in 2005. The Meadowbank property currently hosts measured and indicated resources totaling 22.2 Mt grading 4.8 g/t gold for a contained 3.4 Moz gold. The property hosts additional inferred resources of 3.8 Mt grading 4.8 g/t gold for a contained 0.6 Moz gold. A bankable feasibility study and subsequent bank due diligence completed in December 2005 defined proven and probable open pit mining reserves of 21.3 Mt of ore grading 4.2 g/t gold for 2.89 Moz contained gold within this resource. The Meadowbank reserves have a discovery cost of approximately US$15 per ounce. The mining plan calls for an 8.1 year mine life from three closely spaced open pits with average annual production of 330,000 ounces per year at projected total cash costs of US$201 per ounce (assuming a long term gold price of US$400/oz. and an exchange rate of US$0.75 per Cdn$1.00).

Ongoing exploration at the site in 2006 was directed at reserve definition of the Cannu zone, a high grade and potentially open pittable gold zone discovered in the fall of 2005, and exploration for new gold discoveries along the 25 km Meadowbank gold trend.

The Cannu zone mineralization represents a potential 350 metre northern extension of the proposed Portage open pit, which contains an estimated 1.59 Moz of reserves. The 2006 exploration program included systematic infill and step-out drilling to define the extent of the Cannu mineralization and enable a reserve estimate. Recent intersections include 11.08 g/t gold over a 5.00 metre width and 5.43 g/t gold over a 13.39 metre width.

Drilling completed during the 2006 program also discovered a new zone of mineralization, the Goose South zone, located approximately 400 metres south of the Goose Island deposit. Recent intersections include 5.61 g/t gold over 3.60 metres and 110.52 g/t gold over 1.74 metres.

Some of the other significant accomplishments achieved by Cumberland in 2006 included receiving the positive recommendation from the NIRB for development of Meadowbank, announcing a production decision and securing at least Cdn$254 million for its gold loan facility. Cumberland has initiated procurement, staging and shipping of equipment and supplies for construction of a conventional four season access road from Baker Lake to Meadowbank. Subject to the timely receipt of all ancillary permits and requisite financing, production is expected to commence in late 2008 or early 2009.

METHANE RELEASE FROM DEGRADING ARCTIC PERMAFROST

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Most practicing geoscientists and engineers are well aware that permafrost, or ground at temperatures below 0°C, is widespread over much of the Arctic and must be carefully considered as a unique natural phenomenon affecting a wide variety of activities conducted in northern regions. While considerable effort has been devoted to characterizing the geotechnical properties of shallow permafrost, there is a surprising lack of knowledge about the physical properties of deep permafrost, which in areas such as the Mackenzie Delta and southern Beaufort Sea can extend to depths of more than 650 m.

One aspect that is particularly under-studied are microbial regimes within permafrost, for which a variety of factors including ground temperature, geopressure, and organic constituents, as well as the distribution, phase, and chemistry of ground water are critical in controlling carbon storage and mobility. Methane and other greenhouse gases, which may be formed in situ by microbial processes or migrate into permafrost from lower thermogenic sources, constitute potential dynamic elements of this system. Conspicuous open holes in lake and river ice observed by hunters and trappers active on the permafrost landscape appear to be maintained throughout the winter by continuous gas release from underlying sediments. Workers drilling both shallow and deep wells in permafrost are also aware of the risk of encountering shallow gas deposits, which in some cases can be over-pressured, thereby constituting a significant geohazard potential.

This presentation will review potential sources of greenhouse gases associated with the permafrost environment of the Mackenzie-Beaufort region, and will consider the sensitivity of various elements of this system to temperature forcing due to climate change. Evidence of surface discharges of methane gas associated with pingo-like features in the Beaufort Sea, and with "pock mark" features in lakes and river channels of the Mackenzie Delta, will also be reviewed. Finally the scientific rationale for proposed International Polar Year Project 113 (http://www.ipy.org/development/eoi/proposal-details-print.php?id=113) to undertake scientific drilling in the Arctic will be presented in the context of possible new opportunities for addressing knowledge gaps in this field of study.

RESEARCH AND DEVELOPMENT STUDIES OF THE MALLIK GAS HYDRATE DEPOSIT, MACKENZIE DELTA, NWT

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The Mallik gas hydrate field, located at the northeastern edge of the Mackenzie Delta, consists of an interbedded sequence of highly concentrated gas-hydrate-bearing sands from 890 m to 1106 m depth. Ground temperature and pressure conditions are similar to many offshore settings, however at Mallik ~600 m of permafrost condition the geothermal regime rather than cold sea bottom temperatures. Quantitative well log analyses and core studies have documented numerous discrete gas hydrate layers exceeding 110 m in total thickness. High gas hydrate saturation values, in some cases exceed 80% of the pore volume, establish the Mallik field as one of the most concentrated gas hydrate reservoirs in the world. The abundant geologic and engineering data available at the site, the advantageous logistics, and the similarities to many offshore occurrences offers many unique research and development opportunities.

The first documentation of gas hydrate occurrence was made by Imperial Oil Ltd. during the course of drilling of the Mallik L-38 exploration well in 1972. In the early 1990s, Canadian interest in gas hydrates from an energy and environmental perspective led the Geological Survey of Canada (GSC) to undertake a regional appraisal of gas hydrates in the Mackenzie Delta area, characterizing geothermal and geologic factors controlling their occurrence. Through the initiative of Japan's 1995-2000 gas hydrate research program, interest in the Mallik site was renewed in 1998. At that time the Japan National Oil Corporation (JNOC) and the GSC formed a partnership to undertake gas hydrate drilling, coring and geophysical studies. However, no production testing was undertaken. The Mallik 2002 Gas Hydrate Production Research Well Program was undertaken with a primary goal to conduct the first modern production testing of gas hydrates. The program participants included 7 partners from five countries. A unique aspect overall was the integration of science and engineering through the implementation of a diverse, multidisciplinary research program. Three research wells were completed. Mallik 3L-38 and 4L-38 were primarily for temperature studies and x-hole tomography. Mallik 5L-38 was a production well used for short duration pressure drawdown experiments and thermal heating experiments. Numerous novel geophysical experiments were conducted, continuous cores were collected through the gas hydrate interval.

Natural Resources Canada Ltd. and Japan Oil Gas Minerals National Corporation are actively planning a return to the Mallik site in 2006 to undertake long term gas hydrate production testing and conduct further research and development studies. Pending regulatory approvals, a two winter program is planned. The field program involves completion of a production test well and a monitoring well during the first year with limited duration production testing. The wells will then be suspended to allow a return to the site for longer term production testing during the second year. Aurora Research Institute, the research and scientific arm of Aurora College, has with the support of the GNWT agreed to act as the designated operator for the field program.

Inuvialuit Oilfield Services, an Inuvialuit Development Corporation/Schlumberger Company, will act as the integrated project manager for the program.

LOWER PALEOZOIC HYDROCARBON PLAYS IN THE CANADIAN ARCTIC ISLANDS

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About 50 wells were drilled into the lower Paleozoic succession in the Arctic Islands during the 1970s and 1980s. Despite large structural and stratigraphic closures and the presence of apparent source units, only one small discovery, at Bent Horn on Cameron Island, was made.
Six geological episodes control the hydrocarbon potential of the lower Paleozoic. 1) Deposition of Cambrian to Ordovician shelf carbonates, clastics, and evaporites; 2) step-back of the shelf margin and deposition of widespread Silurian shale; 3) north-south folding and thrusting of the Early Devonian Boothia Uplift; 4) progradation of the Mid to Late Devonian clastic wedge in front of the advancing Ellesmerian orogenic belt; 5) folding and thrusting of the Late Devonian-Early Carboniferous Ellesmerian Orogeny; 6) rifting and deposition of the Carboniferous to Cretaceous Sverdrup Basin.

Geochemical data indicate that thick potential source intervals occur in Silurian shales of the Cape Phillips, Eids, and Bathurst Island formations. The total organic carbon content can be >2% over 300 m, with intervals of 4 to 5% TOC common. Rock-Eval pyrolysis indicates oil-prone, Type II kerogen.

Thermal maturity data indicate that maximum burial (and maximum hydrocarbon generation) in most areas occurred during burial by the Mid to Late Devonian clastic wedge. The thermal maturity of specific horizons is complicated, with high maturity in the west, central, and northeast parts of the islands, but decreasing thermal maturity towards the present-day edge of the Sverdrup Basin (i.e., northward).

Maximum burial occurred before the folding and thrust faulting that formed the Parry Islands and Ellesmere fold belts. Hydrocarbon migration appears to have occurred before trap development over much of the lower Paleozoic in the Arctic. Also, the old age of hydrocarbon generation (about 380 Ma) means that most hydrocarbons have likely been lost due to leakage or degradation. Only salt or anhydrite will form an effective seal over this length of time.
Two hydrocarbon plays can be envisaged. The first occurs on eastern Bathurst Island and adjacent water bodies. In this area, the Eleanor River Formation was folded into N-S trending folds during the Early Devonian Boothia Uplift. The Eleanor River Formation is overlain by thick evaporites of the Baumann Fiord Formation. If porosity occurs within the Eleanor River Fm., then hydrocarbons generated during Late Devonian burial of Silurian shales on western Bathurst Island could have migrated into these pre-existing folds and have been preserved by the salt seal.

The second play occurs on the Sabine Peninsula and elsewhere on northeastern Melville Island, Cameron Island, and an unknown distance below the Sverdrup Basin to the north. The Devonian clastic wedge was thin in this area and the Silurian shale retained a low level of thermal maturity with most of its hydrocarbon-generating potential intact. Burial by sediments of the Sverdrup Basin in the ?Triassic or ?Cretaceous may have been sufficient to drive Silurian strata back into the oil or gas window. This second hydrocarbon charge could be held in traps within the lower Paleozoic succession or in upper Paleozoic and Mesozoic traps.

SUMMARY OF DIAMONDEX RESOURCES' EXPLORATION ACTIVITIES ON THE BRODEUR PENINSULA, BAFFIN ISLAND

Diamondex Resources

Diamondex Resources started exploring for diamonds on Baffin Island's Brodeur Peninsula in 2005. This presentation will provide an update on advances in exploration and new discoveries made on the property over the course of Diamondex's quest to find Baffin Island's first diamond mine.

The Brodeur Property is located on the Brodeur Peninsula of Baffin Island in northeastern Nunavut, Canada. The property is located approximately 1,300 km NW of Nunavut's capital city of Iqaluit, and 125 km west of the recently closed Nanisivik mine site. Arctic Bay, the closest community, is located 100 km to the east. The property consists of 32 claims with an area of 82,640 acres and 6 prospecting permits with an area of 328,564 acres.

The property is located in the Lancaster Plateau region of the Northern Arctic. The Lancaster Plateau is part of the Arctic Lowlands and in general has abundant exposed bedrock with elevations ranging 300-765 m above sea level (asl).

Diamond exploration in the northeastern Canadian Arctic has been ongoing since at least the early 1970's. During the mid 1960's, mapping of the Somerset Island region revealed the occurrence of a "basic intrusive" (Blackadar, 1963). In the early 1970s, samples of this basic intrusive were positively identified as kimberlite by Mitchell and Fritz.

Kennecott Canada Exploration Inc (KCEI) began exploring the Brodeur Peninsula region for diamondiferous kimberlites starting in 2001. In 2003, they announced the discovery of the diamondiferous kimberlites known as Tuwawi, Kuuriaq, and Nanuk.

In the spring of 2005, Diamondex entered into an agreement with KCEI, which gave them the exclusive option to earn a 100% interest in the property, subject to an underlying Property Acquisition Agreement.

Exploration efforts of Diamondex Resources Ltd in the 2005-06 field seasons were conducted in two stages: the first focussed on the initial evaluation of the entire property by increasing sample density, and completing airborne surveys over the entire property. The second concentrated on the advancement of known kimberlite occurrences.

During the 2005 field program two airborne geophysical surveys were completed. The FUGRO Resolve (mag/EM) helicopter-supported airborne magnetic survey comprised 720 line km, and the McPhar Geoscience fixed-wing magnetic survey comprised 14,679.4 line km. The FUGRO airborne survey focused on an area of the property with three known kimberlite bodies (Tuwawi, Kuuriaq, and Nanuk), while the McPhar survey was a regional survey across the property area not surveyed during previous exploration campaigns. Also completed in 2005 were ground magnetic and gravity surveys over known kimberlite occurrences. The sampling program of 2005 included the collection of 372 till and stream samples as well as 164 geochemical (overburden) samples.

Over the course of the 2006 season 362 follow-up till and stream samples were collected. Fourteen high priority geophysical anomalies identified through airborne surveys conducted in 2005 were surveyed with detailed ground magnetic investigations. Diamondex geologists prospected 114 geophysical targets. As a result of the prospecting two new kimberlite outcrops were discovered which fall on strike with the known Kuuriaq trend. At this time it is not known if these showings are connected over the length of the Kuuriaq trend or if they represent separate intrusions. Kimberlite float was also located at two other targets while prospecting.

Kimberlite from the outcrops located this season is presently being processed for micro-diamond content, stream and till samples are also in the lab being processed for kimberlite indicator minerals. Further modeling of existing geophysical data has produced at least ten new high priority magnetic targets in close proximity to the Tuwawi kimberlite. Planning and preparation has begun for a ground geophysics / diamond drill program which is slated to begin during the second quarter of 2007.

SURFICIAL GEOLOGY RESEARCH PROGRAM IN THE SOUTHERN MACKENZIE VALLEY: APPLICATION TO THE PROPOSED GAS PIPELINE AND RESOURCE DEVELOPMENT

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Surficial geology research conducted by the Geological Survey of Canada in southern Mackenzie Valley during 2005 and 2006 has yielded a large amount of geoscience data, including: surficial geology maps, till geochemistry, geotechnical analyses, drift isopach maps and clast lithology-till provenance studies. Recognizing the pressing need for geoscience data in light of the proposed

Mackenzie Valley Gas Pipeline, we have not only undertaken a wide diversity of studies, but also the manner and formats in which this data is being published.

Geological data will be published as follows: A. Digital maps: 1) Surficial geology maps on digital topography at 1:100 000 scale; 2) Radarsat image maps; and 3) Landslide maps linked with a database. B. The fourth product is a CD-ROM containing all of the above mentioned maps, in addition to the geochemical data and drift isopach (thickness) and potential granular aggregate maps. Surficial geology polygons will be linked to sites and their description captured as figures showing stratigraphy accompanied by photographs, sample locations, pie charts of lithology, and geochronological data where possible. In turn, sample numbers will be linked with the geochemical data, age reports, macrofossil reports, etc.

A special emphasis is being placed for the landslide data, and in some areas mapping extends up to 50 km east and west of the pipeline. Till, glaciolacustrine sediments and shale bedrock are most common along the eastern boundaries of the Mackenzie Mountains and plains developed further east: the area covered by this program. Here, postglacial stream incision reaches over 100 metres. Landslide development is most common in particularly where new rivers and minor streams are developed. Landslides formation is widespread and active today, and can change the landscape over the span of a year.

GEOCHRONOLOGY AND SETTING OF LATE CRETACEOUS TO PALEOCENE KIMBERLITES IN THE BUFFALO HEAD HILLS, NORTH-CENTRAL ALBERTA

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Forty-eight occurrences of kimberlitic rocks have been discovered in three separate areas of northern Alberta: Mountain Lake, Buffalo Head Hills and Birch Mountains. The diamondiferous Buffalo Head Hills kimberlite field, located approximately 450 km NNW of Edmonton in north-central Alberta, consists of 38 known pipes and is the main focus of this collaborative Northern Resource Development study. These bodies are dominated by lapilli-bearing olivine crystal tuffs and lesser massive hypabyssal kimberlite. Twenty-six of the pipes are diamond-bearing with at least three kimberlites having estimated grades of between 12 and 55 carats per hundred tonnes. Prior to this study, the emplacement ages for three bodies (K5, K7A and K14) were estimated from U-Pb isotope perovskite dates of 88 ± 5, 86 ± 3 and 87 ± 3 Ma, respectively (Carlson et al. 1999).

New Rb-Sr macrocrystal phlogopite and U-Pb groundmass perovskite age determinations yield robust emplacement ages for nine previously undated pipes. These new data show Buffalo Head Hills kimberlite magmatism occurred in at least two separate episodes: Early to Late Paleocene (Danian to Selandian) at ~64-60 Ma and Late Cretaceous (Campanian to Coniacian) at ~88-81 Ma. The younger Paleocene emplacement age is characterized by Rb-Sr model 1 and model 3 ages of 60.3 ± 0.8 Ma and 59.6 ± 2.8 Ma for the K19 and K1A kimberlites, respectively. A Danian weighted average U-Pb perovskite age of 64.1 ± 0.6 Ma was obtained for the BM2 kimberlite, which is the only known kimberlite in the Buffalo Head Hills characterized by massive porphyritic kimberlite (hypabyssal-facies kimberlite). Late Cretaceous kimberlite emplacement is evident in both isotopic systems and for 9 pipes with model 1 ages of between 88 ± 5 Ma (U-Pb perovskite, pipe K5) and 81.2 ± 2.3 Ma (Rb-Sr phlogopite, pipe K252).

The palynological study of a continuous Buffalo Head Hills Cretaceous bedrock section that spans vertically over 460 m and sedimentary clasts from selected kimberlite, support ~64-60 Ma and ~88-81 Ma ages. Sedimentary clasts incorporated in the ~64-60 Ma kimberlite suite include Maastrichtian and Paleocene miospores, and Turonian to Santonian host mudstone strata are contemporaneous with the ~88-81 Ma kimberlite suite. Chronostratigraphic correlations between sedimentary basin configurations and kimberlite emplacement are also evident. For example, a sedimentological hiatus with a maximum extent of Early Turonian through Early Santonian, spans ~88-81 Ma ages and suggests kimberlite emplacement might possibly be related to extensional tectonics.

A correlation exists between emplacement ages, geochemical compositions and diamond content, where diamond-bearing magmatism was prevalent in the Buffalo Head Hills area during the Coniacian. In contrast, ~64-60 Ma magmatism is representative of weakly diamondiferous to barren, shallow-sourced magmatic events.

HYDROCARBON STUDIES RELATED TO THE PLATEAU FAULT, CENTRAL MACKENZIE MOUNTAINS, NORTHWEST TERRITORIES

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As a contribution to the Geological Survey of Canada's Secure Canadian Energy Supply Program, petroleum resource-related studies are being conducted in the Mackenzie Mountains as part of a new project (Mackenzie Corridor: Access to Northern Energy Resources). This work is being carried out, in part, collaboratively with the Sekwi Project, a bedrock-mapping initiative of the Northwest Territories Geoscience Office.

The Mackenzie Mountains generally have been discounted as a prospective area for hydrocarbon exploration based on breached structural traps at the level of Paleozoic reservoirs, and presumed over-maturity with regard to hydrocarbon generation. However, some workers have pointed to

the poorly understood Plateau Fault as a potential, large-scale hydrocarbon trap, or have suggested that Palaeozoic strata east of the Plateau Fault might be prospective.

During the 2006 field season, work by GSC researchers in the Mackenzie Mountains focused on: collecting samples for organic geochemistry to determine maximum burial temperatures and source-rock potential; addressing key issues in stratigraphic correlation to facilitate a new compilation of stratigraphic data for the region; and targeted mapping of key areas of complexity along the Plateau Fault. Results from geochemical and stratigraphic work currently are being compiled and analyzed; this presentation will focus on new results regarding the structural geology of the Plateau Fault.

Earlier workers interpreted the Plateau Fault either as a steep reverse fault with little or no potential for trapping Paleozoic reservoirs in the footwall, or as a shallow-dipping thrust sheet with a prospectively large area of Paleozoic reservoir rocks trapped beneath. Detailed mapping along the leading edge of the fault in the central Wrigley Lake (95M) map area has been undertaken in an effort to find further evidence of the nature of this fault. Mapping in 2006 necessitated several changes in the map distribution of stratigraphic units associated with the Plateau Fault, and has also resulted in detailed changes to the structural complications in the immediate footwall of the fault. Map compilation and cross-section construction are currently underway to test the geometry of the fault, but preliminary field observations suggest at least local development of a shallow-dipping thrust sheet.

GNWT SPECIES AT RISK LEGISLATION

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This presentation will review the recent public consultation document which is being used to draft the new GNWT legislation to assess, list and recover species at risk in the NWT. The presentation will explain the consultation to date and the steps remaining in the GNWT legislative process to complete the legislation.

CAMECO CORPORATION'S URANIUM EXPLORATION NWT AND NUNAVUT: 2006 UPDATE

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Cameco Corporation, in pursuing the goal to be a dominant producer of nuclear fuel and clean electricity, has identified economic uranium potential worldwide including several prospective districts in Nunavut and the Northwest Territories (NWT) of Canada.

In 2006, Cameco Corporation invested approximately 2.3 million dollars in the staking, permitting and exploration of seven projects in Nunavut and the NWT. These properties are located in the Hornby Bay Basin near Great Bear Lake, NWT and the Thelon Basin and the Nueltin Lake area in Nunavut. The Proterozoic Hornby Bay and Thelon basins are roughly analogous to the uranium-rich Athabasca Basin of Northern Saskatchewan. The Nueltin Lake project has similarities to the Mary Kathleen district in Australia. All projects are in the early stages of exploration.

Cameco has had a history of exploration in the north through predecessor companies and as Cameco in the 1990's in the Baker Lake area. In the past, the target was primarily the unconformity uranium model. Through our exploration programs and due to the recent improvement in the uranium market other models are being explored. For example, in the Hornby Bay Basin both unconformity and Mountain Lake – Gabon style tabular models are being explored, while in the Thelon Basin region exploration involves both "basement" mineralization (e.g. Kiggavik) as well as the classic unconformity model (e.g. Boomerang). The Nueltin Lake project, discovered in the early 1990's, has been dormant until recently, due to a depressed uranium market and exploration budgets. Recent work on this area suggests evidence of metamorphism of metasediments related to a skarn environment, similar to the Mary Kathleen uranium district in Australia.

Exploration projects incur various levels of economic, environmental and exploration risk. The earliest grass roots stages involve the largest land packages and greatest economic and exploration risks, but correspond to the lowest environmental impacts. As exploration advances, target areas decrease in size and environmental impact commonly increases, ideally with a corresponding improvement in economic and exploration risks.

Communicating the nature of exploration risks is an important step in the development of social license and supportive community relationships. Cameco's exploration process has always included community relations initiatives from the earliest grass roots stages through mine development, production and ultimately reclamation stages. Exploration geologists are at the forefront of these initiatives in the exploration stage and are accountable to the communities within their project areas. As well, corporate efforts to develop and maintain community support are sustained within the wider community. Targeted information presentations and opportunities for community members to experience operating uranium mines first hand has proven to be a very successful approach from both company and community perspectives.

PRELIMINARY INVESTIGATIONS OF THE UPPER DEVONIAN TO LOWER CARBONIFEROUS TUTTLE FORMATION, EAST RICHARDSON MOUNTAINS, YUKON

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Field investigations of Upper Paleozoic strata on the eastern flanks of the Richardson Mountains during summer 2006 were part of the multi-year "Regional Geoscience Studies and Petroleum Potential, Peel Plateau and Plain, Northwest Territories and Yukon" project, launched in 2005. Yukon studies were conducted in the Trail River map area (NTS 106L) and the northern portion of the Wind River map sheet (NTS 106E).

The focus of the investigation was the Upper Devonian to Lower Carboniferous Tuttle Formation which historically has been an exploration target for oil and gas. Five Yukon wells and one NWT well have had minor gas shows in the Tuttle.

Objectives of the 2006 fieldwork were 1) to locate exposures of the Tuttle Formation and neighbouring units at various localities along the east Richardson Mountains; 2) to measure stratigraphic sections of the Tuttle, where accessible; 3) to determine the stratigraphic position of the Tuttle Formation; 4) to compare outcrop characteristics of Tuttle with subsurface drill core; and 5) to sample the Tuttle Formation and neighbouring units for age determination, source rock potential, thin section, porosity/permeability and thermal maturation studies. Data collected will be used to enhance future petroleum resource assessments of the Peel region.

Exposures of the Tuttle Formation were limited to outcrop on the Trail River, Road River and along a north-trending ridge in the vicinity. No complete sections of the Tuttle were identified in the study area and sections were complicated by local folding and faulting. Approximately 100 m of Tuttle was measured in detail. On the Trail and Road rivers, the Tuttle Formation cropped out as two resistant ribs comprising mainly sandstone, with subordinate conglomerate, separated by largely covered intervals that are interpreted as fine clastic rocks (likely shale). Shale dominated packages directly above and below the Tuttle coarse clastic packages were also examined.

GEOLOGY AND DEVELOPMENT UPDATE FOR THE NICO GOLD-COBALT-BISMUTH DEPOSIT, SOUTHERN GREAT BEAR MAGMATIC ZONE, NORTHWEST TERRITORIES, CANADA

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Fortune Minerals Limited owns an 89% interest in the NICO Cobalt-Gold-Bismuth deposit located 160km northwest of the City of Yellowknife, Northwest Territories, Canada. NICO and Fortune's nearby Sue-Dianne Copper-Silver deposits are the most significant Canadian examples of Proterozoic iron oxide hosted polymetallic deposits, more commonly referred to as hydrothermal iron oxide copper-gold deposits or "Olympic Dam-type".

NICO is situated in the southern Great Bear magmatic zone, a post-Wopmay orogen plutonic terrane with volcanism, dating from 1870 Ma, and A-type rapakivi granite plutonism at approximately 1856 Ma.

The NICO deposit is hosted in iron- and potassium-altered, brecciated subarkosic wacke and siltstone of the Treasure Lake Group occurring beneath the volcanic unconformity. Host "black rock" amphibole-magnetite-biotite schists and ironstones are capped by potassium feldspar-magnetite felsite (altered rhyolite) of the Faber Group. Feldspar-quartz-amphibole porphyritic dykes crosscut the deposit and are feeders to the overlying volcanic pile. The deposit occurs within three, 45-50 degree dipping, stacked stratabound lenses of ironstone, each between 5 and 70 metres in thickness. The lenses can be traced up to 1.5km along strike and are between 100 and 450 metres in width. They contain approximately 10% disseminated and fracture-filling sulphides, including cobaltian arsenopyrite, cobaltite, cobaltian loellingite, native bismuth, bismuthinite, chalcopyrite, and local pyrrhotite and native gold. The current NICO resource is 24.6 million tonnes comprised of 9.6 million tonnes of underground resources, grading 2.14g/t gold, 0.15% cobalt and 0.21% bismuth, and 15 million tonnes of open pit resources, grading 0.31g/t gold, 0.11% cobalt and 0.11% bismuth. New reserve estimates are in preparation as part of a bankable feasibility study in progress.

Paragenetic studies of the NICO geology demonstrate that early, reduced, high-temperature mineral assemblages are overprinted by late, oxidative, low-temperature assemblages. These together with stratigraphic relationships, indicate fluid mixing at shallow crustal levels was important in deposit formation. Proximity of the NICO deposit to subvolcanic porphyries and other border phases of the Marian River Batholith, together with geochronology and mineralogy studies, suggest they are all genetically related.

In excess of $20 million has been expended at NICO since discovery of the deposit by Fortune in 1996. Work has included geology and geophysical surveys, approximately 300 drill holes, extensive environmental baseline, metallurgical and engineering studies, and small-scale pilot plant testing. In 2006, the Company conducted an $11 million underground bulk sampling program in order to prepare 250 tonnes of mineralized material that was composited from 3,000 tonnes collected from the lower gold zone, 145 metres beneath the surface. A large scale pilot

plant will be conducted at SGS Lakefield Research Limited this spring while the project undergoes an Environmental Assessment and mine permitting. NICO is planned to be developed using a combination of underground and open pit mining with a process plant to produce gold dore, cobalt cathode and bismuth concentrate. Fortune recently purchased the Golden Giant mill at Hemlo, Ontario for relocation to NICO. Commercial production is planned in early 2010 and the mine would employ approximately 300 people at the currently contemplated 4,000 tonne/day production rate.

SEDIMENTOLOGY OF CRETACEOUS WAVE-DOMINATED PARASEQUENCES OF THE TREVOR FORMATION, PEEL PLATEAU, NWT

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The stratigraphic succession of Martin House, Arctic Red, and Trevor formations constitute the Cretaceous rocks of the Peel Plateau and Plain region at the front of the Mackenzie Mountains, west of Norman Wells. Martin House Formation is a transgressive marine sandstone. Arctic Red Formation is a thick succession of basinal marine mudstone.

Trevor Formation is subdivided into three facies: mudstone; interbedded sandstone and mudstone; and amalgamated sandstone. Mudstone facies is composed of poorly indurated mudstone, siltstone, and very minor sandstone interpreted as offshore. Interbedded sandstone and mudstone contains storm beds of hummocky cross-stratification (HCS), parallel lamination and combined flow ripples that alternate with interlaminated mudstone and ripple cross-laminated sandstone. Interbedded facies is interpreted as transitional to lower shoreface. Superimposed storm deposits of HCS and parallel lamination comprise the amalgamated sandstone facies, interpreted as middle shoreface.

Trevor formation parasequences, 20-60 m thick, are bounded by flooding surfaces commonly associated with a transgressive lag. A typical upward-coarsening succession is from mudstone, through interbedded sandstone and mudstone, to amalgamated sandstone facies. Associated HCS increases in wavelength from small (10-30 cm) to large scale (1-3 m). These parasequences record lower and middle shoreface progradation of fine grained sand into an offshore mud-rich marine basin.

NWT PROTECTED AREAS STRATEGY - UPDATE ON IMPLEMENTATION

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The NWT Protected Areas Strategy was established in 1999. Since that time, communities in the Sahtu, Dehcho and Akaitcho have advanced areas into the PAS planning process. The Mackenzie Valley Five Year Action Plan provides enhanced capacity for implementing the PAS process in the Mackenzie Valley, and as a result a number of new areas of interest have been identified in the past two years. An overview of the process, as well as a brief update on the status of areas proceeding through the PAS will be presented.

As the PAS continues to gain momentum, exercising due diligence and ensuring that decision making is based on the best available information becomes even more paramount. To this end, Step 5 of the PAS process requires that detailed assessments of the ecological, economic and cultural values of each area are completed. Non-renewable resource assessments are one of the Step 5 requirements. The PAS is working with the Geological Survey of Canada and the Northwest Territories Geoscience Office to ensure the timely completion of quality NRA work. This relationship will be described as will current PAS practices for engaging industry and opportunities for further industry involvement.

DRILL HOLE DATA COLLECTION, MANAGEMENT, AND STORAGE USING A GBIS DATABASE

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Drilling is the cornerstone of mineral deposit evaluation. Through analysis and modelling, drilling data flows into all key exploration, mining, processing, and economic decisions. For this reason, it is imperative that drill hole data be captured and managed in a manner that is efficient, descriptive, and not subject to error.

Since the discovery of the EKATI Diamond Mine, information science has progressed rapidly - data exists in a multitude of formats, including paper, digital spreadsheets, and various adhoc databases. Formerly, as each kimberlite pipe was reviewed, the collection of spreadsheets was recompiled, checked for errors, and parsed for use in 3D modelling software. This practice was error-prone and time-consuming.

To address these issues, a SQL database designed by St. Arnaud Data Management (SADM) and based on Micromine's GBIS data management system has been implemented for all drill hole data at EKATI. Data is digitally collected, stored, processed, exported, and shared between sites.

Data is collected in the field by entry into an offline database that constrains values by a variety of lookup lists and checks. Periodically, the data is transferred online to an intermediate transfer database for error-checking. Once complete, the data is transferred to a read-only master database where it may be exported to other software. To circumvent the limitations of real-time access *vs* low-bandwidth network connections, the master database is replicated nightly to other sites.

The implementation of this system is ongoing. Designing a system to meet a variety of departmental and individual project needs has required several iterations and much patience. However, the results are promising: as data from the EKATI 2006 drilling projects is processed, EKATI's implementation of GBIS has proved to be an efficient, accessible, and versatile information system. The dark days of "cut-and-paste" are numbered.

A NEW WAY TO VIEW DISTURBANCE ON THE LANDSCAPE: THE WILDLIFE PERSPECTIVE

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Previous studies have documented numerous cases of wildlife responding negatively to resource development but seldom have determined how significant these impacts are. For example a caribou may run from an approaching vehicle, but does that response reduce the fitness of that individual or significantly affect a population either in the short or long term? More research documenting the impacts on wildlife is required beyond just assessing the short-term behavioral changes in individuals. Questions such as how are behavioral responses by individuals manifested at the population or community levels need to be asked. This type of research is challenging because it is difficult to distinguish between natural variability in populations and variability that results from resource development use, particularly when the effect of development is indirect and the response occurs far from the point of disturbance after a time lag or the response occurs at a different scale.

New technologies in wildlife research allow us to better understand how wildlife perceive their environment. Wildlife view their world as a series of patterns, of different scales (patch, community) across a landscape. One of the techniques used to assess landscape pattern is by calculating the lacunarity of the landscape. Lacunarity was originally developed to quantify the geometric arrangement of gaps (lacunae) in solid objects. This index was then adopted to describe gaps in habitat coverage, providing a way to quantify landscape 'texture'. In ecological applications, lacunarity is an index of landscape patchiness that describes habitat contagion

(clumpiness of the landscape) and dispersion (regular or clumped) at multiple scales. This technique is well-suited to assess how wildlife may view change in their environment. Using lacunarity analysis in a GIS environment, the purpose of this work was to create a " measure of human disturbance" that is more meaningful to wildlife. By creating an index that is based on an animal's perspective of their environment we can provide a more meaningful assessment of both short and long-term impacts on wildlife. This index can also provide a benchmark in which to assess changes in future disturbances.

A REGIONAL SYNTHESIS OF DRILLING WASTE DISPOSAL SUMPS IN THE MACKENZIE DELTA AREA, INUVIALUIT SETTLEMENT REGION, NORTHWEST TERRITORIES, CANADA

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In northern Canada, drilling wastes generated during onshore oil and gas exploration have been disposed to large pits excavated in permafrost called sumps. The excavated materials are typically used to cap the sump with the intent of containing wastes within the permafrost. Subsidence and ponding on sump caps and adjacent terrain has lead to concerns regarding the viability of permafrost as a primary containment medium. Collaboration between government, industry and the Inuvialuit led to the development of an assessment protocol for sumps in the Mackenzie Delta region. The site assessments have yielded data which is being compiled by Water Resources Division, Indian and Northern Affairs Canada. The purpose of our study is to produce a regional synthesis of the sump information and to assess factors associated with sump stability. The results of this work will provide in part, the basis for improving site selection guidelines and potential improvements to existing best practices documents.

AMARUK: THE DISCOVERY OF CANADA'S NEWEST DIAMOND DISTRICT

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The Pelly Bay Diamond district was recognized by diamond hunters in 2003. The staking and permit rush that ensued was one of the greatest diamond staking rushes in Canadian history. Once the dust settled Diamonds North (DDN) found itself with a joint venture on the Amaruk Project which encompassed over 8 million acres and included a senior partner funding all the costs of exploration and half the staking costs.

Exploration focused on first assessing the potential of the entire property with a 12,000 line kilometre airborne geophysical survey and 3500 till samples. During the first field season DDN's 43-101 mandated site visit resulted in the first kimberlite discovery. With the senior partner

controlling the distribution of funds, the second season of exploration focused on the most obviously anomalous area of the property, the central district. Another 12,000 line kilometres of airborne geophysical data and 2500 till samples along with teams of prospectors lead to the discovery of 15 kimberlite float trains and the first in-situ kimberlite, Umingmak.

With diamond results still pending, BHP Billiton approached Diamonds North with the intent to reduce their participation in the project and cease sole funding. But after intense negotiations DDN gained 100% ownership of the entire property. The diamond results showed significant diamond recovery including a 97 kg sample returning 148 stones and equally important, the recognition that all the kimberlite sampled was diamondiferous. Further, a study conducted by John Gurney of Mineral Services on the quality of diamonds from two of the kimberlite samples showed that "This set of microdiamonds has an unusually positive overall appearance..." and that "The microdiamonds recovered from these two samples have excellent characteristics."

With DDN operating, the 2006 season focused on proving the potential of the property by rapidly putting together an exploration program that resulted in an additional 25,000 line kilometres of airborne magnetics, 1400 till samples and, numerous ground magnetic surveys culminating in the discovery of 4 new kimberlites and 19 new float trains. Three tonnes of kimberlite from drilling and one tonne from float samples are currently being processed for diamond recovery.

Always looking to create shareholder value, DDN has created joint ventures with International Samuel in the Pelly Bay Diamond District adjacent to the Amaruk property, as well as with Arctic Star and Shear Minerals in the Franklin Kimberlite District located to the South West of Amaruk. Diamonds North is now planning the 2007 exploration season with confidence that we are going to discover Canada's next diamond mine.

NEW NADINA DISCOVERS NEW DIAMOND-BEARING KIMBERLITES AT LAC DE GRAS

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The Monument Property has a high density of diamondiferous kimberlites. With three new kimberlite pipes discovered in 2006, there are seven kimberlite pipes and two kimberlite dikes known on the property. The exploration team continues to develop new targets and evaluate each kimberlite already known.

Between 1992 and 2002, Kennecott Canada Exploration Inc explored the property with airborne MAG and EM surveys, ground geophysics, till sampling and diamond drilling, which resulted in discovery of four kimberlite pipes and a kimberlite dike. The property was later explored by Archon Minerals Ltd and BHP Billiton Diamonds who conducted Falcon airborne gravity gradiometer surveys, and drill-tested several targets without success. The current ownership resulted from a deal made when mineral claims were surveyed and brought to lease. The Monument Property consists of three mineral leases located on the south shore of Lac De Gras where operator New Nadina Explorations Ltd holds 57.49% interest with partners SouthernEra Diamonds Inc 22.11% and Archon Minerals Ltd 20.4%. A 1% royalty is payable to Kennecott Canada Exploration Inc and DHK Diamonds Inc. New Nadina Explorations Ltd is operator, and has subcontracted active partner SouthernEra Diamonds Inc to conduct field operations.

Driven by the optimism of late George Stewart, the small company and partners reviewed available data, proposed an exploration plan and budget, and resumed exploration on the ground in 2005 with detailed ground magnetics and Max-Min EM, and a drill campaign to resample and delineate kimberlite DD17. Drilling increased kimberlite DD17's size and establish high-quality diamond sieve data required to evaluate the kimberlite. Exploration drilling also discovered a new kimberlite dike extending west from kimberlite DD42. Two magnetic anomalies and a Max-Min conductor identified by Uwe Naeher, supervisor of field operations, were drill tested in 2006 resulting in three new kimberlite discoveries: RIP, NIC and SONJA. New Nadina also drilled and sampled kimberlite DD17-11, a kimberlite pipe with a confusing name, located 400 m east of DD-17.

New Nadina reports significant diamond populations from five kimberlites tested in 2006. The largest diamond this year came from NIC and weighs 0.17 carats, and diamond sieve data suggests further sampling is required on all five kimberlite bodies. Crews conducted ground gravity, magnetics and EM geophysical surveys, and till sampling in 2006 to develop new exploration targets.

In 2007 the exploration team plans to continue high-density ground geophysics, drill untested high-potential geophysical targets, and conduct mini-bulk sampling of several kimberlites to estimate diamond grade and get an indication of diamond value.

2006 EXPLORATION UPDATE ON THE HACKETT RIVER PROJECT, NUNAVUT

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The Hackett River project is located approximately 480 km NE of Yellowknife and approximately 85 km SSW of the Bathurst Inlet. The project is located approximately 15 km to the NW of the proposed BIPAR all season road route to Bathurst Inlet. The project consists of three zinc-silver rich VMS deposits: 1) East Cleaver, 2) Boot Lake, 3) Main 'A'. Sabina Silver Corporation owns the project subject to a 2% NSR held by Cominco Mining Partnership, an affiliate of Teck Cominco. The deposits are located on Inuit Owned Lands.

The prominent gossan over the Main 'A' zone was trenched in the mid 1950s by a Canadian subsidiary of RTZ but no significant mineralization was discovered. Bathurst Norsemines, a predecessor to Etruscan Resources, drilled and discovered zinc mineralization at the Main 'A' zone in 1969. Cominco optioned the property and conducted additional drilling on the property throughout the early 1970's when the Boot Lake and East Cleaver deposits were discovered. Sabina optioned the property and conducted drill programs in 2004, 2005 and 2006. Sabina drilled approximately 42,000 m on the property since it started in 2004.

Exploration in 2006 focused on expanding the known resources with step-out and infill diamond drilling. A total of 17,293 m was drilled in 2006. Approximately 40% of the total was infill drilling required to upgrade inferred mineral resources to indicated. Step-out drilling was successful in locating additional mineralization adjacent to the known resources. All three deposits remain open at depth. Metallurgical work, geological modeling, baseline water quality sampling and engineering work were also conducted in 2006.

The exploration highlight from the season was the partial delineation of a thick keel of massive sulphides at depth on the Boot Lake deposit. Drilling has outlined what is interpreted to be an extensional listric fault basin filled with a thick (~ 40 m) keel of massive sulphides that rakes to the SE. The sulphide deposit thins gradually down-dip and thins dramatically updip. A thin (0.5 to 5 m) apron of sulphides occurs on the updip side of the keel.

An updated mineral resource estimate is planned for late 2006. A Preliminary Economic Analysis of the Hackett River project planned for late 2006 or early 2007.

ENVIRONMENTAL STUDIES ACROSS TREELINE, MACKENZIE DELTA REGION: A TEMPLATE FOR ADDRESSING CUMULATIVE IMPACTS

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"Environmental studies across treeline, Mackenzie Delta region" is an interdisciplinary research program that investigates the variation and interaction of physical and biological processes across the boreal-tundra transition. The primary objectives of this presentation are: (1) To outline and indicate relations between permafrost, water quality and ecological components of the study; (2) to present some preliminary results; (3) to highlight the importance of understanding regulatory needs when developing research design; and (4) to discuss the utility of developing environmental research and monitoring programs concurrent with conceptual frameworks aimed at addressing cumulative impacts. The generation of interdisciplinary data sets can provide the basis upon which to assess the regional cumulative impacts of development.

USING GEOSPATIAL DATA DURING THE ENVIRONMENTAL ASSESSMENT PROCESS AT NIRB

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The Nunavut Impact Review Board (NIRB) is an Institution of Public Government responsible for the environmental assessment of project proposals in the Nunavut Settlement Area as described in Article 12 of the Nunavut Land Claims Agreement.

The NIRB uses both traditional knowledge and recognized scientific methods in screening and reviewing project proposals. One of the primary tools used to support these decisions is the NIRB's Geographic Information System (GIS). With this tool, project location information provided by the proponent is subjected to a basic GIS analysis to determine a project's proximity to a number of themes which are relevant to the impact assessment process. Digital GIS data representing topography, hydrology, communities and human use areas, protected areas, species at risk areas, culturally or historically significant locations, as well as other land uses and regulatory jurisdictions comprise the bulk of the NIRB's GIS database to date.

The spatial representation of projects on generated maps assists NIRB staff and board members to view and analyze potentially complex information in a user-friendly format.
This information enables the assigned technical advisor to focus on key issues and areas which may need more detailed assessment and review, and to identify potentially impacted communities. This early identification of information is particularly valuable in the screening process and ensures decisions and recommendations are based on the best possible information available.

ENVIRONMENTAL ORE DEPOSIT MODELS FOR THE CANADIAN NORTH – AN INTER-AGENCY COLLABORATIVE PROJECT

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The correlation of environmental behavior with ore deposit types has been recognized since the early 1990s. In simplest terms, an environmental ore deposit model is a compilation of geologic, structural, geochemical, metallurgical, geophysical, hydrological and engineering as well as climatological information pertaining to the environmental behavior of geologically similar deposits, both prior to mining and resulting from mining, mineral processing and smelting. By integrating this information into a traditional ore deposit model, the resultant comprehensive model facilitates communication and cooperation between staff managing diverse components of a mine development project. It will also aid with selecting a combination of methods and strategies to ensure a project's financial success, minimize environmental risks and impacts, and reduce unexpected project costs. Taking all facets of prospective mining into consideration during exploration, one can also learn early if it is economic to mine a given deposit and redirect valuable resources to more favorable targets if warranted.

As the North is generally characterized by a sensitive environment and exploration activities in the three territories have significantly increased in recent years, researchers with Natural Resources Canada in Ottawa, Indian and Northern Affairs Canada in Yellowknife and Iqaluit, and the Yukon Geological Survey in Whitehorse have joined forces to compile environmental ore deposit models particularly relevant to the Canadian North. The primary objective of the three-year collaborative project is to develop simple tools that will forewarn all stakeholders (including mine proponents, regulators and local residents) about potential environmental challenges associated with mining a particular type of ore so that informed decisions can be made. Initial efforts will be focused on sedimentary exhalative massive sulfide deposits in the Selwyn Basin of Yukon, diamond deposits in the Northwest Territories and uranium mineralization in Nunavut. In addition to technology-transfer workshops, the project aims to produce an easy-to-read document that sheds light on the linkages among the geologic attributes of an ore deposit, its environmental setting, mining history/future and environmental behavior. It is anticipated that such a document will help (1) identify essential sets of information that need to be collected to establish pre-mine baseline conditions and avoid wasting valuable resources in collecting irrelevant data at some later stage of a mining project; (2) complete a more robust risk analysis prior to implementing a production decision; (3) expedite the mine permitting process; (4)improve mine operations and progressive reclamation by better anticipating and mitigating production and environmental problems; and, (5) prioritize and plan remediation efforts at abandoned mine lands.

OIL AND GAS POTENTIAL OF NORTHERN MAINLAND SEDIMENTARY BASINS OF MACKENZIE CORRIDOR: AN UPDATE

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Oil and gas potential of Mackenzie Corridor and surrounding areas is the focus of a Northern Energy project under the Secure Canadian Energy Supply program of the Geological Survey of Canada (GSC). The main objective of this multidisciplinary study is to assess the hydrocarbon resource potential of Mackenzie Corridor using quantitative and qualitative geoscience data. Key outputs will be a series of Open File reports that outline the petroleum potential across Mackenzie Corridor, culminating in a Blue Book GSC Bulletin concerning the overall petroleum potential of the entire region. Key collaborators include the GSC, the Northwest Territories Geoscience Office, the Yukon Geological Survey, industry, universities, and northern communities.

The northern mainland sedimentary basin along Mackenzie Corridor has been subdivided into four main exploration regions: Beaufort-Mackenzie Basin, Interior Plains, Northern Yukon and Mackenzie Arc. Over 20 plays, mostly located in the Interior Plains, have been identified and will be the focus of the current study.

The GSC (Calgary) has developed a Petroleum Exploration and Resource Evaluation System (PETRIMES) methodology which will be used to conduct the resource assessment. One of the key steps in this resource assessment is the definition of petroleum plays; there are two exploration play categories: *established plays* and *conceptual plays*. Established plays include areas with discovered pools and established reserves; such plays are further subdivided into mature or immature plays, reflecting their number of discoveries. Conceptual plays comprise areas where pools have not yet been discovered, but which may exist according to geological analyses. Two assessment approaches are utilized by the GSC at the exploration play level: the *discovery process model*, based on pool discovery history, is used for mature plays, whereas the *volumetric probability distribution model* is used for immature and conceptual plays with no pool discovery history. The discovery process is based on documented discoveries for a particular play, and assumes that known discoveries represent a biased sample of the population of pools in a play. In the volumetric probability method, the pool size distribution is based on information from exploratory wells, as well as organic source rock and maturation data, and geophysical and structural data from publicly available reports.

This presentation discusses new and revised petroleum play boundaries within Mackenzie Corridor that have high exploration interest. These include: lower to upper Paleozoic carbonate and clastic plays, Cretaceous plays in Interior Plain and Mackenzie Arc, as well the Plateau

Thrust play in Mackenzie Mountains, and the region of Liard Plateau gas fields. The Arnica/Landry platform play within Mackenzie Arc contains the recent oil and gas discoveries near Summit Creek (Summit Creek B-44 and Stewart D-57 wells) along the eastern edge of the Mackenzie Mountains, bordering Mackenzie Plain.

SEKWI MOUNTAIN PROJECT YEAR 1: BEDROCK MAPPING AND REGIONAL STUDIES IN CENTRAL MACKENZIE MOUNTAINS, N.W.T.

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The Sekwi Mountain project, initiated by the Northwest Territories Geoscience Office, is a 3-year multidisciplinary study of the central Mackenzie Mountains conducted in collaboration with the Geological Survey of Canada and university researchers. The project will provide a better understanding of the stratigraphy, geochronology, geochemistry, metallogeny, and tectonic history of Paleozoic and Proterozoic strata exposed in NTS map areas 105P, 95M and 106A.

During summer 2006, regional mapping was supplemented by detailed studies including 1) structures related to the Plateau Thrust, 2) potential hydrocarbon source rocks; 3) detailed stratigraphy of upper Devonian clastic and Cambrian carbonate rocks; 4) geochemistry and trace isotope; 5) geochronological studies; 6) regional metallogeny; 7) ground checking of anomalies detected in the 2005 geophysical survey and; 8) investigated points of geological interest along the Canol Heritage trail.

Three areas were chosen for the first season of regional mapping based on their different stratigraphy, structural styles and mineral occurrence types. Caribou Pass synclinorium in northwest Sekwi Mountain map area exposes Cambrian through Devonian units at the edge of the Selwyn Basin. Above the Sekwi Formation carbonate, the Road River Group consists of siltstone-sandstone couplets succeeded by chert and sulphide-rich shale. Bitumen occurs locally at the base of overlying Arnica Formation limestone and an extensive Devonian and younger shale package with five mappable subunits – a significant advance over previous reconnaissance maps

In contrast, the Mackenzie Platform succession in the Godlin Lakes area of northeastern Sekwi Mountain map area includes seven thick carbonate formations distinguished by their fossil assemblages. Both Road River Group beneath, and the Devonian clastic package above the carbonate platform are much thinner than their Caribou Pass equivalents. This succession is

tightly folded. At the northeast edge of this area is the underlying, subhorizontal, Neoproterozoic glaciomarine sedimentary rocks of the Rapitan Group. Between these successions there is a gradual change of dip, which suggests a smooth flexure onto the Redstone Plateau. The thrust postulated to lie beneath this plateau may provide a structural trap for hydrocarbon.

In the Keele River area near Fortress Mountain (northeast of Sekwi Mountain map area) we examined footwall and hanging wall stratigraphic units along of the northwest-trending Plateau Thrust and associated splays. Resistant and repetitive carbonate successions of the Upper Proterozoic Little Dal Group are underlain by Katherine Group sandstone and overlain by Coates Lake Group (including the economically important Coppercap Formation) and Rapitan Group. The footwall stratigraphy preserves a Paleozoic succession which contains extensive carbonate fragment breccias, perhaps resulting from solution collapse (e.g. Bear Rock Formation). Copper carbonate and sulphide minerals were noted in strata of Little Dal Group and Coppercap Formation.

With the regional stratigraphic and structural knowledge acquired during the summer of 2006, selected areas straddling the northwest-trending Plateau Thrust will be investigated during 2007.

LESSONS FROM OIL AND GAS EXPLORATION AND DEVELOPMENT IN THE NORTHWEST TERRITORIES OVER THE LAST DECADE

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Nearly 90 years after the discovery of Norman Wells, the Northwest Territories remains largely an exploration frontier - the geology continues to surprise as conventional ideas based on sparse data are challenged; long lead times and high operating costs demand tenacious investors; balance is still being sought between environmental, economic and traditional priorities, and new political and regulatory frameworks are still being tested.

The resurgence of exploration over the last decade in the Northwest Territories has seen the announcement of new gas and oil discoveries in the southern Northwest Territories, the Central Mackenzie Valley, Colville Hills and Mackenzie Delta. Some but not all gas discoveries in the southern Northwest Territories have been connected to the pipeline network and are producing. However, the significance of newer discoveries has yet to become clear - many may require further delineation to become economically viable. Most discoveries must await major investment in infrastructure - specifically pipelines - for production to flow to market.

With these uncertainties explorationists still dare to tread. Why? Most important is the perception of potential: the Mackenzie Valley from the southern border of the Territory to the Delta continues to have the potential for profitable discoveries and plays - not necessarily giants but fields and exploration trends which fit the strategic goals of the rich variety of companies

conveniently located just to our south. Potential can only be confirmed by success, and the discoveries of the last few years fuel interest as well as add to geological understanding. Finally the geographic scale and diversity of northern petroleum geology is fertile ground for new ideas, ideas which come from explorationists. These new ideas can switch exploration momentum from one area to another in a manner which is seldom predictable.

Governments can draw some lessons from watching the recent history of exploration in the Northwest Territories. The first is that the oil and gas sector has invested in the absence of the subsidies of earlier years: the industry has responded to a market-based approach where the rules of the game are fair, transparent and unambiguous. The second is that these rules - the oil and gas regime - should remain stable over time periods which make sense for operating in the North. The third is that governments can facilitate but should not attempt to direct exploration. Finally, the oil and gas industry needs a style of regulation which allows the industry to manage its risks, grow and innovate.

Sustainable development in the North - a future which can includes a dynamic oil and gas exploration sector - can be realized provided the lessons from experience are heeded in finding the necessary accommodation between economic, environmental and social priorities.

IOCG POLYMETALLIC AND URANIUM EXPLORATION IN THE PORT RADIUM-ECHO BAY-CONTACT LAKE DISTRICT, GREAT BEAR LAKE, NWT

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Comprehensive exploration is being conducted over a > 500 km^2 land package assembled by Alberta Star Development Corporation, which centers on the former Port Radium-Contact Lake polymetallic mining district. Exploration commenced in 2005 with extensive reconnaissance and detailed geological, structural, alteration and mineralization mapping and sampling. Geophysical surveys completed to date include airborne VTEM, Magnetics and multiparameter Radiometric surveys, and ground based IP and Magnetics. Diamond drilling commenced in the summer of 2006, and to date ~ 15,000 meters have been completed.

Early work confirms that Proterozoic (ca. 1.8 Ga) rocks of an andesitic stratovolcano complex underlie this district. The region is characterized by exceedingly widespread and robust hydrothermal alterations dominated by alkali-iron and metal enrichments typical of IOCG type systems. A unique aspect of the region is the well-exposed continuum of mineralization styles that range from classic IOCG to Porphyry Cu. The area hosts many igneous-associated hydrothermal centers with intense alterations and disseminated, vein and stockwork Cu-Ag-Au-U-Co-Bi mineralization, and abundant exposures of epithermal-type high-grade Cu-Ag +/- U-Co-Bi-Ni veins and breccias. Other unique styles of mineralization encountered to date include

Ag-rich contact skarns, Ni-Co-Ag-Bi arsenide veins, and a stratabound maar breccia rich in Mo-Cu-Pb-Zn-Ag-W.

The presentation will conclude with a discussion of the exploration models and methods being used, and will present results from field work and drilling available at the date of the conference. Future exploration plans and strategies will also be shared with participants.

OUTLOOK ON THE GEOLOGY OF THE BOOTHIA MAINLAND AREA, KITIKMEOT REGION, NUNAVUT

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Regional geological mapping (1:250,000 scale) and supporting studies of the Boothia mainland (NTS sheets 57A, 57B and 57D), conducted as part of the joint GSC-CNGO Boothia Integrated Geoscience Project, reveal that this part of the north-central Rae domain is underlain by remnants of a Neoarchean volcanosedimentary sequence dismembered by two regionally extensive Neoarchean granitoid suites, with rare occurrences of infolded Paleoproterozoic sedimentary cover sequence. Paleoproterozoic and older rocks are cut by three sets of undeformed diabase dykes with the oldest northwest-trending dykes provisionally assigned to the ca. 1267 Ma Mackenzie swarm. Whereas sulphide-bearing gossans are eye-catchs in supracrustal rocks, the region has demonstrated exploration potential for diamond.

The oldest coherent rock packages outcrop as narrow, northeast striking and highly dismembered belts consisting mainly of psammite, semi-pelite, metabasalt locally with ultramafic layers, and sulphide-bearing (lean) iron formation. The largest of them, outcropping southwest of Murchison Lake, comprises greenschist to lower amphibolite facies metabasalt with subordinate felsic volcanosedimentary rocks containing no detrital zircon <2764 Ma., hence allowing a tentative correlation with the Barclay belt and Mary River Group. These belts are commonly associated spatially with chaotic gneisses likely representing reworked crust. These gneisses are riddled with sub-metric and metric amphibolite and fine-grained psammite-like inclusions and boudins, they show ubiquitous foliation boudinage and contain abundant polyphase granitic mobilisate, and as such, they are best described as metatexite and diatexite. These supracrustal rocks and derived gneisses are second in abundance after widespread granitoid plutonism. Neoarchean plutonic suites in the 2.67-2.66 Ga and 2.60-2.59 Ga ranges are dominated by variably deformed

and metamorphosed I-type, metaluminous, polyphase, commonly porphyritic to augen, biotite ± hornblende monzogranite and subordinate granodiorite; tonalite is scarse, and compositionally more extreme terms including diorite and syenite are rare. The second supracrustal sequence is dominated by marble, pelitic schist with minor psammitic schist and quartzite beds. Detrital zircon study has indicated a Paleoproterozoic age confirming its affiliation to the Northern Chantrey Group, and thus potentially correlative with other Rae domain cover sequences such as the Amer and Piling groups.

The state of strain and recrystallization vary regionally; rocks are mainly massive to weakly foliated with relict igneous minerals and textures in the southwestern part of the study area (NTS 57B), while recrystallized and strongly foliated and/or gneissic in the east and north parts. Metamorphic grade also varies from middle- to upper-amphibolite facies in the southwest, to granulite facies in the north and northeast. In addition, the local preservation of relict granulite-facies assemblages in the central and southern portions of the study area, suggests that granulite-facies metamorphism may have been more widespread than currently distributed. Preliminary geochronological results suggest that the high-grade metamorphic and melting event responsible for the reworking of the Archean volcanosedimentary sequence is presumably contemporaneous to Archean granitoid plutonism. Whereas the granulite facies assemblages and fabric preserved in the northern part of the region (NTS 57D) is also likely of Archean age, the amphibolite facies deformation and metamorphism marking much of the region including rocks of the Northern Chantrey Group is clearly Paleoproterozoic.

AN UPDATE ON SOUTHERNERA DIAMONDS INC. 2006 EXPLORATION ACTIVITIES

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In 2006 SouthernEra Diamonds Inc. operated six diamond exploration projects in the Northwest Territories; the Yamba Lake Project, the Contwoyto Project, the Back Lake Project, the Lac de Gras Project, the Crown 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.

Detailed magnetic surveys and an eleven hole drill program (1034 m) completed in April of 2006 on the **Monument Project** and supervised by SouthernEra led to the discovery of three new, significantly diamondiferous kimberlite bodies. The new kimberlites, named RIP, NIC and SONJA are part of the 1.2 km long Blue Pearl cluster and lie within the same emplacement trend as the kimberlites mined at the EKATI mine. A mini bulk sample program is proposed for the spring of 2007.

On the **Yamba Property** a total of 18 ground geophysical grids were established and a total of 156 line km of magnetic and HLEM surveying were completed. Seventeen detail till samples

were collected to further delineate a prominent pyrope anomaly. Four drill holes (523.7 m) were completed over selected land based geophysical targets.

The **Contwoyto Project** consists of 5 claims located west of Contwoyto Lake and host the Vega kimberlite. Two holes, (196.5 m) were drilled into the kimberlite this summer to provide additional information on geometry and chemistry, as well as micro-diamond data. A total of 74.25 m of mud rich, macrocrystic, pelletal kimberlite was recovered. Micro-diamond results are pending.

The **Back Lake Project** area is located 250 km northeast of Yellowknife, NWT and extends between Munn Lake and Back Lake. A drill program of 6 drill holes (798.6 m) tested several geophysical and geochemical anomalies in the Munn and Margaret Lake areas. Kimberlite was not intersected.

The **KIDME** property is located 100 km north of the community of Lutsel'Ke, NT, approximately 40km southwest of DeBeers Gacho'Kue Project. Two distinct indicator mineral trains transect the northern part of the property. One high priority EM and gravity target was drill tested unsuccessfully in May 2006.

The **Crown East Project** consists of 30 mineral claims located between Hardy Lake, Savannah Lake and Tarpon Lake east of the DIAVIK mine. A total of 20 grids of 144.7 line km were established and magnetically surveyed during July 2006. Four possible drill targets were selected to be drill tested in the spring of 2007.

COMPARISONS OF THE GEOLOGY AND PROPOSED UNDERGROUND MINING METHODS OF THE PANDA AND KOALA KIMBERLITES AT THE EKATI DIAMOND MINE

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The EKATI Diamond Mine has successfully completed the development and commissioning of the Panda Underground Project to extract the ore below the Panda open pit. The dominant kimberlite domain of the Panda Underground, intermixed olivine-rich and mud-rich resedimented volcaniclastic kimberlite (RVK), is very similar to the kimberlite domain characterizing the open pit portion of the pipe. A sublevel retreat mining method is in operation underground at Panda; near-vertical blast rings are drilled and blasted into an open void. Broken ore is mucked with load, haul and dump trucks (LHD's), sized underground then moved to surface through a conveyor system to the process plant.

An advanced feasibility study is in progress at the Koala Underground Project. The Koala pipe is geologically more complex than Panda. The pipe below the open pit is comprised of at least five distinct kimberlite domains. There is a 100 m thick zone of incompetent low-grade mud-rich RVK between the open pit and the stable high-grade olivine-rich primary volcaniclastic kimberlite where mining will be initiated. As a result, it is proposed that Koala will employ sublevel caving; each blast ring shot would be confined and mucked in sequence to maintain the cave of the over-lying low-grade RVK ore. The sublevel cave method seeks to safely defer the mucking of the low grade ore to the latter part of the mine life.

A HABITAT-BASED METHOD FOR MONITORING POTENTIAL PROJECT EFFECTS ON GRIZZLY BEARS

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In the NWT, past baseline assessment and monitoring of impacts from mining projects on grizzly bears has relied on surveying esker complexes for dens and tracks. Although useful for locating den sites, the data could not be used to assess the spatial and temporal distribution of grizzly bear activity throughout a project study area. The results of recent WKSS studies indicated that grizzly bears exhibit distinct seasonal habitat preferences while selecting their home range area, and habitats within their home range. This finding led to the realization that grizzly bear activity could be monitored through measuring the probability of occurrence of fresh bear signs in seasonally-preferred habitat types. At the De Beers Snap Lake Project, measuring the occurrence of grizzly bear sign is being used to determine if the relative activity of bears changes from baseline through operations, and/or with distance from the mine. Based on the recent habitat and diet selection analyses, surveys in sedge wetlands were conducted during spring green-up in mid to late June, while surveys in riparian habitats were conducted in August.

During baseline studies at Snap Lake from 2001 through 2004, 94 plots were surveyed in sedge wetland habitat, and 69 plots were surveyed in riparian and birch/seep habitats within a 3,000 km^2 study area. Plots range in distance from 1 km to 30 km from the expected mine footprint. Annual changes in grizzly bear activity within the Snap Lake study area have been detected in sedge wetland and riparian habitats, but statistical differences were only found in riparian habitat. Overall, the data has provided estimates of the natural variation in the spatial and temporal probability of occurrence of grizzly bear activity in the study area.

With the commencement of construction of the Snap Lake Project in 2005, the objectives of monitoring are to determine if grizzly bear activity changes annually, and with distance from the Project, relative to baseline values, *i.e.* is there attraction or avoidance to the Project. If monitoring indicates that bear sign is more likely to be found near the project site, then this may suggest that bears are being attracted to the site, and adaptive management and mitigation measures could be triggered. Alternately, a lack of bear activity within a certain distance of the mine would likely imply avoidance of the site and provide an estimate of the zone of influence.

The baseline data show that grizzly bear activity is distributed evenly among the sample plots throughout the Snap Lake Project study area. Two years of construction phase or impact monitoring data have also been collected. The combination of four years of baseline data, and the continuation of baseline study methods into the impact monitoring phase will help environmental managers detect any changes to grizzly bear activity around the Snap Lake Project.

This technique has also been used, with some slight modifications to plot selection criteria, at the Jericho, Ekati and Diavik Diamond Mines, and the Hope Bay Gold Project.

URANIUM PROSPECTING IN THE EASTERN HORNBY BAY BASIN, NUNAVUT TERRITORIES

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Uranium potential of the Hornby Bay Basin has been assessed by various workers based on its correlation with the Athabasca Basin and the Thelon Basin in terms of geological and structural similarities and types of uranium occurrences. During the summer of 2006, Adriana Resources Inc. completed a program of uranium prospecting, sampling, airborne geophysical surveying, and limited geological mapping covering an area of 1000 km^2 in the eastern part of the basin. The uranium radiometric anomalies discovered during this survey have been evaluated on the basis of uranium source, mobilization and trapping potential and can be categorized into the following types:

1. Anomalies Associated with the Tabb Lake Graben Structure: Radioactivity ranging from 500 cps to more than 10,000 cps was recorded in meta basaltic and schistose basement rocks of Akaitcho Group exposed on both sides of a downthrown Hornby Bay sandstone block. The sandstone in contact is bleached, and the basement rocks are dipping inwards at 35 to 60 degrees. This graben structure is approximately 2.5 km long and 800 to 1500 meters wide. Based on the field data, it is interpreted that the heat generated during Muskox Intrusive event derived uranium from the adjoining rocks while the Akaitcho Group graphitic rocks provided a reducing environment for uranium trapping.
2. All Night Lake Anomalies: Continuous radioactivity (200 to 400 cps) is recorded in rhyolite sills within the Dismal Lakes sediments. It is an indicator for potential uranium source. The low uranium- thorium ratio recorded in the field samples using a spectrometer indicated potential leaching of uranium at the margins of these sills; whereas the Dismal Lakes sediments can provide favorable environment for uranium trapping and concentration.
3. Pointer Lake Anomalies: Located north of Drill Lake, where general radioactivity in the granitic basement is 300 to 500 cps. Radioactivity up to 600 to 900 cps was recorded in a north south trending shear zone. The granite has an unconformable contact with the

overlying Dismal Lakes Group sediments. Radioactivity up to 300 cps is in dark grey to greenish grey siltstone and shale of Dismal Lakes Group. Chemical analysis of the samples from the granitic basement show low uranium and high thorium values indicating uranium depletion in the basement. This area is considered as a potential target for further exploration.

4. A shallow geophysical conductor anomaly has been interpreted to exist to the west of the Pointer Lake and All Night Lake anomalies. The conductor was picked up at 50 m and 185 m depths and it covers approximately 100 km^2 area. The presence of a conductor in the down dip direction of the radiometric anomalies has further enhanced their potential as exploration targets.

TYHEE DEVELOPMENT CORP'S YELLOWKNIFE GOLD PROJECT

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Tyhee Development Corp continued the exploration of its wholly-owned Yellowknife Gold Project, 90 km north of Yellowknife in 2006. A resource estimate published in July 2006 reported a combined Ormsby – Nicholas Lake Measured and Indicated resource of 7.9 million tonnes grading 3.80 gpt gold, representing 975,000 ounces of gold. The 2006 exploration program focused on completing more than 20,000 metres of surface diamond drilling over the entire length of the Ormsby and Discovery metavolcanic members.

The Giauque Lake Formation is informally defined to include the metasedimentary rocks spatially associated with the metavolcanic amphibolites which comprise the Ormsby and Discovery members. Metasedimentary rocks of the Giauque Lake Formation differ from but are gradational with typical Burwash Formation. More recent mapping is interpreted such that the Discovery Shear Zone coincides with a regional antiform along which the amphibolite bodies are exposed. Gold mineralization occurs as silicified domains of pyrrhotite, garnet, biotite and carbonate metasomatized hydrothermal breccias transecting the Ormsby and Discovery mafic metavolcanic members within the Discovery Shear Zone. The Discovery Shear Zone is considered to have provided the extensional stress regime that permitted movement of hydrothermal fluids and the deposition of gold mineralization into dilatant areas. Gold mineralization occurs over a 3 km strike-length and to depths of more than 700 m below surface.

REGIONAL GEOSCIENCE STUDIES AND PETROLEUM POTENTIAL, PEEL PLATEAU AND PLAIN: LOWER TO MIDDLE PALEOZOIC MACKENZIE-PEEL SHELF

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A four-year project (2005-2009) entitled "Regional Geoscience Studies and Petroleum Potential, Peel Plateau and Plain, Northwest Territories and Yukon" is a collaborative study among the Northwest Territories Geoscience Office, Yukon Geological Survey, and Geological Survey of Canada. Peel Plateau and Plain lies along the northern Mackenzie Corridor. The study area has widespread hydrocarbon potential, and more than 70 exploratory wells have been drilled. The project objective is to improve and update knowledge of regional geology, including stratigraphic relationships, depositional and tectonic histories, basin evolution, and petroleum potential. A reliable future supply of oil and gas is a current priority of territorial and federal governments. New geological knowledge in the north is necessary to stimulate petroleum exploration, industry investment, and economic development for the benefit of Northerners.

Field work in the Northwest Territories took place in Norman Wells (NTS 96E), Fort Good Hope (NTS 106I-96L), Sans Sault Rapids (NTS 106H), Upper Ramparts River (NTS 106G), and Snake River (NTS 106F) map-areas, and was complemented by field work in Trail River (NTS 106L) and Wind River (NTS 106E) map-areas of the Richardson Mountains, Yukon. More than 30 stratigraphic sections were studied that span the Proterozoic to Cretaceous succession. Samples were collected for sedimentary petrology, reservoir potential (porosity and permeability), source rock potential (Rock-Eval/total organic carbon pyrolysis), and for biostratigraphic indicator fossils (conodonts, palynomorphs, foraminifera). Data will be used to improve regional correlation between exposures at surface and existing well and subsurface data of Paleozoic Mackenzie-Peel Shelf to Richardson Trough, and Mesozoic Peel Trough.

Lower to Middle Paleozoic studies in the northern Mackenzie Mountains focused on an east-west transect across Mackenzie-Peel Shelf (or Mackenzie Plain Depocentre in the Cambrian). Field work on potential reservoir rocks, source rocks, seals, and unit thicknesses provides new data for hydrocarbon resource assessment of several conceptual plays. Preliminary porosity measurements yielded 4.4% for Mount Cap sandstone (basal Cambrian siliciclastics play), up to 9.4% for Franklin Mountain Formation dolostone and 5.1% for Mount Kindle Formation dolostone (Cambro-Ordovician platform play), up to 6.1% for Arnica Formation dolostone breccia (Arnica/Landry platform play), and up to 10.6% for the Ramparts Formation (post-Hume reef or Kee Scarp play). Rock-Eval/total organic carbon values are forthcoming, but reconnaissance values include: up to 0.39% for Cambrian shale in Mackenzie Plain Depocentre, up to 2.49% for Road River Group shales in Richardson Trough, up to 11.92% for Hare Indian Formation in Imperial Hills (Peel Plain).

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

MID-CRETACEOUS GRANITOIDS IN THE SOUTHWESTERN NORTHWEST TERRITORIES AND SOUTHEASTERN YUKON: IMPLICATIONS FOR MAGMA SOURCE REGIONS, TECTONIC SETTING, AND METALLOGENY

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A comprehensive study of mid-Cretaceous intrusions in the Mackenzie and Selwyn mountains of southwestern Northwest Territories and southeastern Yukon was undertaken to assess the regional metallogenic potential and to better define the source and tectonic setting of the magmatism. The study area comprises the easternmost extent of the Tintina Gold Province (TGP), an elongate band of Cretaceous intrusions characterized by metalliferous and non-metalliferous plutonic suites.

Four plutonic suites of the TGP have been identified within the study area: Tombstone (90-94 Ma), Tungsten (95-99 Ma), Tay River (96-100 Ma), and Hyland (100-106 Ma). Tombstone suite intrusions are oxidized/reduced, alkaline/subalkaline, meta- to peraluminous (ASI ~ 0.8-1.15), medium-coarse grained, hornblende-biotite-(pyroxene) quartz monzonite, quartz monzodiorite, and granodiorites associated with disseminated Au-Bi-Te, Sb-skarn, Pb(Ag)-Zn-As-Cu vein occurrences. Tungsten suite intrusions are very small to small, fine-medium grained, weakly K-feldspar porphyritic (<0.5 cm), reduced, subalkaline, weakly peraluminous (ASI ~ 1.0-1.15), biotite +/- muscovite-(garnet/tourmaline) monzogranites associated with W-(Cu-Au) skarn occurrences. Tungsten suite intrusions may be distinguished geochemically from all other suites by *Th/U >>1, resulting from a high degree of fractionation and the crystallization of monazite, and background plutonic tungsten concentrations are depleted (<50 ppm) relative to Tombstone and Tay River suite intrusions. A sub-suite, Tay River-Tungsten (96-100 Ma), shares features of both Tungsten and Tay River suites and is associated with Cu-skarn, and distal Pb(Ag)-Zn vein occurrences. Tay River suite intrusions are typically very large, oxidized/reduced, sub-alkaline, weakly peraluminous (ASI ~ 1.0-1.1), medium-coarse grained K-feldspar porphyritic (>1 cm), biotite-hornblende granodiorites associated with Pb-Zn replacement-style occurrences. Tungsten suite intrusions are inferred to represent highly fractionated melts derived from coeval Tay River suite intrusions. Hyland suite intrusions are similar to Tay River suite intrusions but are more peraluminous (ASI ~ 1.0-1.2), biotite monzogranite and granodiorites typically associated with W-skarn occurrences.

Trace element discrimination diagrams are inconclusive with respect to magma type (S- or I-type), and the rare earth element primitive mantle normalized profiles of all the intrusive suites are depleted in high field strength elements (Nb-Ta-P-Ti). Furthermore, on the epsilon Nd vs.

initial Sr ratio plot intrusions from all four plutonic suites plot as a trend from lithospheric mantle isotopic compositions towards upper crustal isotopic compositions, indicating that they are not wholly derived from partial melting of middle to upper crust. Several plug-like intrusions of the Hyland, Tay River, and Tombstone suites and coeval unaltered mafic dykes have anomalously low *Rb concentrations, signifying a role for a Rb-depleted source region such as crustal material that has undergone a prior partial melting event. There are several possible magma sources consistent with the above: (1) multiple partial melting events of immature arc-derived sediments, (2) high temperature partial melting of mafic lower crust (hornblende-bearing), and/or (3) influx of a mantle melt/fluid component. It is likely that a combination of these factors have operated to varying degrees, resulting in the geochemical and isotopic signatures expressed by all four plutonic suites and the broad trend towards more primitive magmas with younger plutonic suites.

*normalized to the primitive mantle (Sun and McDonough, 1989)

DEFINING A SUITABLE LEVEL OF SITE CHARACTERIZATION – CASE HISTORY ON THEINFLUENCE OF AN UNDETECTED HIGHLY PERMEABLE GEOLOGIC STRUCTURE ON INFLOWS TO THE A154 OPEN PIT AT DIAVIK DIAMOND MINES INC., LAC DE GRAS, NWT

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The Diavik Diamond Mine is producing diamonds from two orebodies, the A154 South and A154 North kimberlite pipes, discovered beneath the waters of Lac de Gras. Innovative dike technology with appropriate water collection and treatment systems allowed Diavik to start open pit mining the ore bodies in 2002. To allow planning, engineering, and implementation of sufficient water handling infrastructure, reasonably accurate estimates of groundwater inflow quality and quantity over the life of mine are required. Prior to mining, a numerical model using the continuum approach was developed for regional- and site-wide water management. After approximately two years of mining, groundwater inflows to the pit were found to exceed those predicted by the base case hydrogeologic model. The most likely explanation was flow through Dewey's Fault zone. As this fault was not explicitly accounted for in the model, a detailed hydrogeologic investigation was conducted to evaluate its geometry and hydraulic properties. A multi-disciplined approach was used and involved core logging, fluid logging, geophysical logging, packer testing, a pumping test, and water quality sample collection. The results of the field investigation were used to update the conceptual and numerical models and to develop a Discrete Fracture Network (DFN) model to address small scale problems such as flow into future underground drifts. The updated numerical hydrogeologic models predict that up to 70 per cent of the groundwater inflow to the A154 N/S open pit is through the relatively narrow fractured rock zone associated with Dewey's Fault. Consistent with the continuum model, the DFN model predicts that inflow to a drift excavated in Dewey's Fault will be approximately 10 times the inflow to a drift excavated in competent rock. The DFN model provides a better understanding

of the distribution of these inflows on a local scale over the length of the drift. This presentation will look at questions related to the level and suitability of characterization required to meet the pre-mining, mining and post-mining stages of the Diavik Diamond Mine Project.

GEOMETALLURGICAL MAPPING: A NEW TOOL FOR TECHNICAL RISK REDUCTION

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Geometallurgical Mapping is a new tool to document variability within an orebody and quantify the impact of geology (host rocks, alteration and structure) and mineralogy on grinding, metallurgical response and metal recovery processes. The quantitative, spatially constrained database that is created can be readily integrated into 3-D block models and mine planning activities. Thus it is an important tool to reduce the technical risk associated with new mine developments or expansions.

Normally undertaken during pre-feasibility planning stages, the first step of Geo-Metallurgical Mapping is to review the geology, mineralogy and other critical parameters and construct a Geometallurgical Matrix. This matrix provides an objective base to guide sampling and/or compositing activity for physical property and metallurgical testing. Depending on the project, an array of testing techniques can be used to generate the data that is fed into the Geometallurgical Model.

For instance, a new state-of-the-art instrument known as the QEM-SCAN (quantitative evaluation of minerals using scanning electron microscopy) facilitates the rapid simultaneous collection of mineral identification, association, size, textural and liberation data, thus building a database of quantitative information. QEM-SCAN data can be cross-referenced to data from other disciplines. Grinding tests could include Bond Work Indices, the JK Drop-Weight test, the MacPherson 18”mill test or the SPI Index. Other tests such as flotation kinetics, locked-cycle tests, GRG gold, sink/float tests and various leaching tests might also be used.

While the range and number of tests needed is project-dependant, the Geometallurgical Mapping approach allows the development of empirical models or interdependent relationships, grounded by spatially-constrained real data. This means that extensive data sets collected using less expensive testing methods can be meaningfully correlated with results from complex specialty tests to yield realistic metallurgical recovery data.

With Geometallurgical Mapping completed, the resulting database can be integrated into an overall 3-D block mine model. Now, metallurgical response can be realistically forecast for specific blocks, perhaps sampled only by drilling. Mine planning can then incorporate the forecasted metallurgical response and generate future project cash-flows; opening the door to economic optimization of the mine exploitation.

This paper establishes the geometallurgical mapping approach and shows how it can be used to guide metallurgical sampling. It also reviews a suite of the common tools and presents an integrated case study.

SPECTRAL SIGNATURES (0.4-2.5 UM) OF IOCG ALTERATION ASSEMBLAGES, CONTACT LAKE, GREAT BEAR MAGMATIC ZONE, NWT

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We report preliminary results on the spectral reflectance properties of the dominant alteration types recognized in the Contact Lake region of the Great Bear Magmatic Zone, NWT. Our intent is to examine which alteration type can be singled out from spectral measurements, paving the way for their potential identification from airborne or spaceborne observations. The Contact Lake Belt hosts widespread IOCG-type polymetallic mineralization exposed in numerous showings along its entire length. Recent exploration activities (2005-2006) by Alberta Star have documented sizable potassic (K-feldspar and magnetite), phyllic (quartz-sericite-pyrite), sodic (albite), hematite (earthy hematite), and magnetite (magnetite-actinolite-apatite) alteration zones. As part of this study we examined weathered surfaces of outcrops within each alteration zone and collected reflectance measurements between 400-2500nm with an Analytical Spectral Devices radiometer at a nominal spectral resolution of 3nm at 700nm, 10 nm at 1500 and 2100 nm. Though displaying variable amplitude, the spectra of each alteration type present common absorption features suggesting that each type can be represented by a unique signature. The potassic and sodic alteration show similar overall profiles but can be distinguished on the basis of the location of an hydroxyl feature (OH^-) near 2200nm. These results suggest a potential to remotely map the distribution of these alteration types using hyperspectral airborne or spaceborne imaging given sufficient spatial resolution. Hyperspectral imaging offers unique capability to identify and map surface minerals, potentially offering a means to map exposed alteration zones, gaussans, and bedrock geology over large expanses of the Great Bear Magmatic Zone.

SNAP LAKE DIAMOND PROJECT GEOLOGY UPDATE

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The Snap Lake diamond project, located 220 kilometers north east of Yellowknife is currently in the second year of construction with planned commissioning for September 2007. Three thousand meters of underground development were completed during April 2004 to June 2005 to define planned mining blocks, test extraction methods and determine local grade estimation. Work in 2006 and 2007 is focused on delivery and erection of permanent buildings. During construction, July 2005 to September 2007 a further 7000 meters of underground development is current with the objective to complete mining blocks and complete infrastructure for full production.

The Snap Lake kimberlite dyke is intruded in sub horizontal compression cracks, average 2.5 meters thickness, in a series of brittle Archean granite gneiss and metavolcanic amphibolites. The dyke dips gently to the north east at ~15^{o}, covers 550 Ha area and amounts to an inferred resource of 25 million tonnes, grade estimated at 1.2 carats per tonne. Although complicated by dyke emplacement characteristics the kimberlite is found to be relatively consistent in overall thickness and location. Variations found are areas of steep dipping dyke (structural controls) and break up zones. In line borehole radar surveys have been adopted on the Snap Lake project to delineate anomalies prior to production.

Production goals include 3150 tonnes per days for an annual extraction of 1.1M tonnes per year. Due to the narrow nature of the dyke and the risk of dilution to cost per tonne extraction methodologies are being explored.

BEDROCK GEOLOGY OF SW BAFFIN ISLAND: A NEW TECTONOSTRATIGRAPHIC FRAMEWORK

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The 2006 South West Baffin Integrated Geosciences project (SWBIG) is a partnership between the Canada-Nunavut Geoscience Office, the Geological Survey of Canada (Northern Resources and Development Program) and the Qikiqtani Inuit Association designed to update geoscience knowledge throughout a 30,800 km^2 region of Nunavut. Targetting southwestern Baffin Island was required given the gap in geoscience knowledge stemming from mapping, last undertaken in the mid 1950's - early 1960's, compounded by a complete absence of regional aeromagnetic data and the need to assess the mineral and carving stone potential of the greater Cape Dorset area. New bedrock and surficial mapping, till sampling and resource assessment activities during the

2006 fieldseason, accompanied by release of new regional aeromagnetic coverage have addressed this gap.

Southwestern Baffin Island exposes polydeformed and metamorphosed plutonic and supracrustal rocks that, based on regional correlations, appear to be mainly Paleoproterozoic in age. Supracrustal rocks are well exposed in both the eastern and western parts of the project area in two structural basins separated by an intervening plutonic-dominated antiformal culmination. Three distinct supracrustal sequences are recognized. South of Mingo Lake, orthoquartzite, marble, extensive psammite-semipelite and derived paragneiss are correlative with the type <1.93 Ga Lake Harbour Group exposed further southeast near Kimmirut. This orthoquartzite-marble-semipelite succession is also exposed in the west (Foxe Peninsula), where it is overlain by a thick, homogeneous succession of well-bedded aluminous quartzite (Lona Bay quartzite). Overlying the Lona Bay quartzite, is a heterogeneous supracrustal belt comprising mafic, ultramafic ± intermediate volcanic rocks interbeddded with conglomerate and quartzite. This locally gossanous volcanic belt extends from the southwest coast some 100 km across southern Foxe Peninsula, and was designated the Schooner Harbour belt. Sills of peridotite, gabbro ±leucodiorite intrusive into the Lake Harbour sequence may be hypabyssal expressions of Schooner Bay volcanism.

Throughout the map area, plutonic rocks are dominated by two phases of monzogranite that commonly cut supracrustal rocks. In general, biotite-magnetite monzogranite is exposed across the southern map area, whereas orthopyroxene±clinopyroxene±hornblende±biotite monzogranite (charnockite) is exposed across the central and northern portions. Both of these phases may belong to the ca. 1.86-1.84 Ga Cumberland Batholith. At several isolated localities in the central map area and across much of the northwest, foliated biotite tonalite ±granodiorite, devoid of supracrustal inclusions, is pervasively cut by monzogranite veins. Accordingly, these rocks appear to represent older rock units that may, in part, constitute basement to the supracrustal sequences.

Patterns of exposed supracrustal and plutonic rocks reflect a polyphase deformation history that includes penetrative fabric development (S_1) during southwest-directed D_1, and tight to isoclinal F_2 folding during southwest- to south-directed D_2, followed by open crossfolding (D_3) and localized dextral transcurrent shearing. Metamorphic mineral assemblages across the map area record a significant gradient in peak temperature conditions as revealed by granulite-facies garnet-cordierite±orthoyroxene assemblages in paragneiss and greenschist- to amphibolite-facies assemblages elsewhere. A change in structural level as well as proximity to the Cumberland Batholith, is thought to have played a determining role in the metamorphic conditions recorded at the present erosion surface.

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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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. The NWT-PAS Ecological Working Group is working on identifying potential core representative areas in parts of the Mackenzie Valley, where we currently have several under-represented ecoregions. We now have some preliminary results from our model showing the areas in the Mackenzie Valley that would best meet our goal to protect core representative areas in each ecoregion. The desired outcome is that some core representative areas be moved to legislated protection via the Protected Areas Strategy. This presentation will provide an update on the work that has been done. Methodology, preliminary results, challenges, and next steps will be discussed.

MANTLE STRUCTURE BENEATH THE WOPMAY MARGIN OF THE SLAVE: ARCHEAN OR PROTEROZOIC?

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Teleseismic earthquakes recorded at seismic stations array in the central and western Slave craton show some directional dependence in arrivals. We use both waves traveling through the Earth's core and surface waves to estimate large-scale structural fabrics in the mantle beneath the Wopmay margin. Modeling of the azimuthal dependence indicates two nearly horizontal layers of anisotropy within the mantle, similar to the rest of the craton, and thus indicating Archean mantle extends at least this far west. However, results using station ILKN at Indin Lake suggest anomalous north-south structure through much of the mantle. Its correlation with the trend of the Wopmay Fault zone may indicate that this zone is at least crustal penetrating. Comparisons with recent crustal seismic reflection profiles from the Gawler craton in Southern Australia suggest such structures can control Olympic Dam type Cu-Au deposits and may make such deposits possible in the Wopmay margin if Proterozic reworking of the margin was as significant.

THE LATEST IN SLAVE MANTLE ARCHITECTURE AND MORE ON KIMBERLITE TRENDS

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Teleseismic earthquakes recorded at a 25-station array in the Slave craton between 2001 and 2006 provide sufficient distribution in back azimuth to demonstrate directional dependence in arrivals. This applies to waves traveling through the Earth's core and to surface waves, both of which are used to estimate large-scale structural fabrics in the mantle beneath the Slave craton. Modeling of the azimuthal dependence indicates two nearly horizontal layers of anisotropy within the mantle, and implies a stacking of two Archean lithospheres about 2.6 Ga and possible introduction of organic carbon into the subsequent deep mantle lithosphere. Vs-wave anisotropies increase with depth from 1% at the Moho to 9% at 200 km, but vary across the craton. Independent studies of P- to S-wave conversions at layer boundaries indicates that the upper layer of anisotropy occupies approximately the uppermost 120 km in which the fast polarization direction strikes generally north-south, coinciding with regional-scale (D2) fold axes mapped at the surface. The fast polarization direction of the deeper layer aligns with current North America plate motion. Its correlation with trends of coeval kimberlite eruptions within the Lac de Gras field and the doubling of anisotropy magnitude there suggests that within the kimberlite field it can be at least partly attributed to structural preferred orientation of a swarm of vertical kimberlite dykes inferred to exist to depths of 200 km.

GEOHAZARDS IN SHALLOW WATERS OF THE BEAUFORT SEA

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Recent oil/gas activity in the Mackenzie Delta region and exploration drilling in the offshore highlights the need for information on seabed properties in the shallow nearshore portion of the Beaufort Sea. Little new information on seabed properties and processes has been acquired in the past several decades in this region. Potential exploration and development activities including dredging and pipeline installation require current information for development of appropriate design parameters.

In collaboration with the Canadian Hydrographic Service (CHS) integrated sidescan sonar and multibeam bathymetry surveys were used to map the seabed morphology within the shallow margins (4-8 m) of the southern Canadian Beaufort Sea. A repetitive sidescan sonar survey was performed over 2 consecutive years that encompassed an area over 100 square kilometers. Much of the seabed between 4-6 m has been heavily influenced by ice scour despite being well within

the zone of landfast ice. Scour directions show several preferred orientations dominated by onshore-offshore movement. The repeat surveys allow the assessment of the persistence of the scours from one year to the next. Sidescan images show subtle variations in backscatter strength although the origin of the variability is not yet known. Cursory visual analysis of grab samples indicates that the low backscatter zone may exhibit higher water content than higher backscatter zones which is consistent with the possibility that they are related to the deposition of fluid mud layers. Further evidence for this is provided by wave and current measurements undertaken during the same surveys that reveal the potential for complete mobilization of the shallow seabed under wave orbital velocities that exceed the threshold of sediment resuspension.

Multibeam bathymetry data previously available only in deeper water has now been acquired in the shallow nearshore region. The high spatial resolution of these data (30 cm horizontal and 10 cm vertical) permits identification and quantification of seabed features. Although no obvious sedimentary bedforms (e.g. ripples or sandwaves) have been identified during preliminary analysis, there are indications that strudel scours may be present. These would represent the first such features identified in this region. Strudel scours occur as a result of drainage of spring flood waters through holes in the sea ice with erosion of the sediments beneath. They are common offshore from smaller deltas to the west along the Alaska and Yukon coasts. Maximum ice and strudel scour depths are being currently being assessed. The lack of bedforms is consistent with the interpretation of sediment cores that depict graded bedding deposited during storm events. These data provides fundamental baseline information on the materials and processes that affect ongoing and future development activities in the region.

AN EXPLORATION UPDATE FOR THE AVIAT AND QILALUGAQ DIAMOND PROJECTS, MELVILLE PENISULA, NUNAVUT

Stornoway Diamond Corporation

Stornoway Diamond Corporation continued to explore and make additional discoveries on the 4 million acre Aviat Project located on the northern Melville Penisula. The Aviat Project is a joint venture between Stornoway (70%), BHP Billiton (20%) and Hunter Exploration Group. During the 2006 field season the company completed spring and summer drill programs designed to test the source of unexplained indicator mineral anomalies at the east end of the Tremblay Corridor. Interpretation of existing kimberlite occurrences, previous drill campaigns, in conjunction with the results of the 2006 drill programs indicates that there are 11 known kimberlite bodies: AV1, AV1 West, AV2 Upper, AV2 Lower, AV3, AV4, AV5, AV67, AV8 Upper, AV8 Middle, and AV8 Lower within the eastern portion of the Tremblay Corridor. All bodies tested to date have been proven diamondiferous.

Within the eastern part of the Tremblay Corridor, eight separate kimberlites intersected over an area measuring about 1.5 by 3.5km comprise shallowly dipping (8 to 20 degrees), macrocrystic hypabyssal kimberlite sheets with associated zones of kimberlite breccia. These kimberlites are thought to form a portion of a sequence of layered, horizontally stacked sheets separated by

vertical distances of 10 to 30m. Future work will test the hypothesis, supported by 62 drill holes completed in the area to date, that the eight eastern kimberlites represent occurrences of a single system of stacked kimberlite sheets underlying the entire 1.5 by 3.5 kilometer area.

In addition to the drill programs, other work completed included ground geophysics, prospecting traverses over about 775km that successfully identified 122 new kimberlite boulder occurrences, and the collection of approximately 2,100 till samples to better define 15 unsourced indicator mineral trains with promising diamond inclusion chemistry.

In early July 2006 Stornoway Diamond Corporation announced an option agreement to further explore BHP Billiton's 1.04 million acre Qilalugaq Diamond Property on the Rae Isthmus located near Repulse Bay on the southern Melville Peninsula. The Qilalugaq Property was originally acquired by BHP Billiton in 2002 and has undergone several phases of exploration using airborne geophysics, property wide till sampling, drilling and limited minibulk sampling. Eleven kimberlites were discovered as a result of this work, ten of which were analysed and proved diamondiferous. The largest kimberlite identified by BHP Billiton is a 14 ha (approximately) complex made up of the Qilalugaq 1, 2, 3, and 4 pipes and represents the largest kimberlite discovered in the eastern arctic to date.

During a three week reconnaissance exploration program operated by Stornoway, weathered, in situ, hypabyssal kimberlite was found along two separate parallel linear structures. These new kimberlite occurences, Naujaat 1 and Naujaat 2, have been traced at surface over strike lengths of approximately 3000m and 600m, and average 4.5 m and 2.3 m in width. Elsewhere on the Qilalugaq Property, Stornoway extracted in excess of 4,200kg (wet) of material from the previously drilled A28 kimberlite from two test pits; collected 240kg of kimberlite for caustic fusion and indicator mineral analyses; completed ground geophysics on seven targets, including some of the known kimberlites that had not previously been evaluated by ground geophysical techniques; collected 469 till samples, including detailed samples designed to follow-up five known anomalous areas with promising mineral chemistry; and identified kimberlite float boulders in proximity to known kimberlites.

TWO UNIQUE KIMBERLITE SOURCES AT THE CHURCHILL DIAMOND PROJECT, NUNAVUT

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The 2.0-million acre Churchill Diamond Project is a rapidly expanding kimberlite district that was discovered in 2003 by Shear Minerals Ltd., and partners Stornoway Diamond Corp. and BHP Billiton Diamonds Inc.

Geographically the project is located between the communities of Rankin Inlet and Chesterfield Inlet in the Kivalliq region of Nunavut, Canada 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. Historic exploration (pre-2000) in the region has been largely for gold and base metals. Previous kimberlitic discoveries include kimberlite dykes (192-214 Ma) intersected in drilling at the Meliadine gold deposit and the diamondiferous Parker Lake (Akluilak) dyke (1832 Ma). In 2003 Cumberland and Comaplex drilled 11 kimberlites, and the GSC reported numerous kimberlite float occurrences throughout the Meliadine trend.

Since 2003 Shear and its partners have discovered 51 kimberlites including six kimberlite outcrops over a 60km by 60km area on the Churchill and Churchill West projects. Ongoing exploration has been driven by the quality and abundance of indicator minerals, specifically the pyrope garnets of which approximately 27% are subcalcic G10 pyropes, implying derivation from within the diamond stability window. Higher interest pyrope indicator mineral counts and chemistry occur within two priority corridors – the Josephine River ('JR') and Sedna corridors.

In 2005, two high interest kimberlite float occurrences were discovered in the JR and Sedna Corridors. Both were characterized by coarse grained textures hosting pyropes with thick kelyphite rims. This float was unique and different from all kimberlite discoveries found to date on the property. As a result, it was hypothesized that two types of kimberlite existed at Churchill. The 2006 program confirmed this with the two types characterized as follows:

> 1: Strong magnetic signatures, fine grained, dominantly magmatic textures with large olivine phenocysts, low indicator mineral abundances dominated by ilmenite with rare garnet; poor mineral chemistry and a warm geotherm; emplacement ages of between 170-242 Ma, and low diamond carrying capacity. 46 discovered to date.
>
> 2: Subtle magnetic signatures, medium to coarse grained, two generations of olivine including macrocrysts, high indicator mineral abundances with high garnet counts and low ilmenite counts with good mineral chemistry; cool geotherm, and moderate to high diamond carrying capacity. Four examples discovered to date: PST003, Jigsaw, Notch and Kahuna. Geochronology currently underway.

Within the Sedna corridor three of the type 2 kimberlites have been discovered. The PST003 discovery was made following up a till sample that recovered abundant pyrope, kimberlite fragments in the oversize, and 162 diamonds. Drilling during the spring 2006 program directly under the sample confirmed a 040 trending dyke, 150m in length with a vertical dip. A total of 303 diamonds were recovered from a 22.8kg sample. Trenching on the Jigsaw kimberlite confirmed a 1m wide east-west trending vertical kimberlite dyke, with a geophysical signature traceable over 1km, a total of 157 diamonds were recovered from a 44.35kg sample. The Notch kimberlite is a 1.0m wide vertical dyke that trends north-south with a confirmed strike length of over 3,000m, a total of 778 diamonds were recovered from a 104.8kg sample. Diamonds recovered from these three dykes are generally clear and colourless with good crystal shape dominated by octahedrons. Within the JR corridor, one 3.5-4m wide kimberlite dyke of type 2

has been trenched and drilled, referred to as the Kahuna kimberlite. To date the known strike length of this dyke based on geophysics is approximately 5,500m.

In 2006 the joint venture partners completed a $5 million exploration program that tested high interest areas based on favorable G10 dominated indicator mineral dispersions. Kimberlite has been located at four of these; an additional 17 high interest dispersions remain unsourced. The 2007 exploration will focus on the continued exploration for new kimberlites as well as ongoing exploration of the known dykes. A total of approximately 20 tonnes of kimberlite collected from the four kimberlite dykes will be processed for macrodiamond content in the coming months.

BAKER LAKE GOLD PROJECT, TANQUERAY RESOURCES LTD

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Recent drilling at Tanqueray Resources Ltd's Baker Lake Project, Nunavut, intersected significant mineralization, along strike from gold mineralization discovered during the 2005 drilling campaign. Drilling also tested geophysical and geochemical targets including historical high grade representative surface samples up to 83.7 grams per ton gold.

Tanqueray Resources Ltd's claims and leases totaling approximately 118,000 hectares are located 35 km northwest of the Hamlet of Baker Lake. The tenements cover a belt of prospective greenstones, 70 km long by up to 10 km wide, in the same stratigraphic package that hosts Cumberland Resources' 2.9 million ounce Meadowbank gold deposit.

The stratigraphy comprises predominantly basalts and mafic to felsic volcaniclastics of the Archean-aged Woodburn Group of the western Churchill Structural Province. Stratigraphy, dipping shallowly to the west and northwest, is folded about gentle westerly plunging axes, and is overprinted by subsequent tight to isoclinal folding.

Gold and base metal mineralization, hosted by folded and sheared volcaniclastics and sediments, occurs as banded sulfides, in quartz veins and in shears. Silver and base metal mineralization occurs elsewhere in dolomitized ultramafic units. Alteration facies include silicification, carbonatization, and various alteration minerals such as micas, garnet, chlorite and clay.

Exploration work to date includes prospecting and soil sampling, as well as detailed geophysics surveys comprising magnetometer, electromagnetic, Ohm-mapper resistivity, and induced polarization. Seven gold zones were identified: Ayak Gossan, Ayak Gossan West, Ayak Mouth, Jaeger Main, Jaeger Extension, Sam Vein and Muskox Head. In addition, several high grade silver occurrences were identified, including the East Silver zone.

To date, 23 diamond drill holes totaling 2,300m tested six gold zones (Ayak Gossan, Ayak Mouth, Ayak Gossan West, Jaeger Main vein, Sam Vein 25, and Muskox Head), a silver-base metal zone (East Silver), and a target having potential kimberlite characteristics (T25).

The main showing, Ayak Gossan, is located on nearly coincident HLEM, magnetic, and IP conductors. The surface expression is gossanous outcrop and associated quartz vein tension arrays (TVAs). Outcropping mineralization comprises pyrite-arsenopyrite+/- chalcopyrite +/- magnetite rich quartz veins, with mineralized polymetallic banded sulfides intersected in core drilling. Late stage shearing has produced structural complexity, with associated remobilization of mineralization. Five drill holes tested the Ayak Gossan this field season, following up significant mineralization intersected in 2005.

Drill assay results were pending at the time of submission of this abstract, and are expected to be available at the Geoscience Forum.

BASE-METAL MINERALISATION IN THE BORDEN BASIN DISTRICT, NORTHERN BAFFIN ISLAND, NU

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Carbonate strata of the Mesoproterozoic Uluksan Group, Bylot Supergroup, Borden Basin (northern Baffin Island, NU), host numerous base-metal showings, including the Zn-Pb-Ag deposit that was mined at Nanisivik (1976 - 2002). The Borden Basin is a Mesoproterozoic aulacogen comprising three northwest-trending grabens that developed in Archean basement rocks. Base-metal showings are concentrated in the Milne Inlet Graben, and are hosted by the Society Cliffs Formation, which is expressed as a peritidal carbonate platform in the eastern part of the Milne Inlet Graben (MIG), and as a laterally equivalent basinal laminite with local deep-water carbonate mounds in the western part. With the exception of one poorly understood and subtle east-directed compressional event that was contemporaneous with deposition of middle to upper Bylot Supergroup strata, and later emplacement of Neoproterozoic Franklin dykes, the rocks have been subjected to no significant tectonic effects. The dykes fill some of the major northwest-trending faults that accommodated basin rifting. The nature and age of the mineralising event at Nanisivik and at showings throughout the basin are controversial. A variety of dating methods have yielded mineralisation ages for the Nanisivik ore-body that range from Mesoproterozoic (ca. 1.2 Ga) to Paleozoic (461 Ma).

Ongoing work indicates that mineralisation is controlled by three structural phenomena. (1) Antiform/gas-cap type replacement-style mineralisation is known only from Nanisivik and two major showings in the western part of the basin. It is localised by subtle folding in the basinal host rocks, which was a function of either the early compressional event, or of compactional folding around the tops of giant deep-water mounds. Such folding and mineralisation are known only from the westernmost part of the MIG. This type of mineralisation is Zn- and Pb-rich. (2)

Fracture-controlled mineralisation in the vicinity of major, northwest-trending intra-graben faults is dominant in the central MIG, either in uppermost Society Cliffs Basinal laminites (presumably capped by the shale aquiclude of the overlying basal Victor Bay Formation), or in the lowermost Society Cliffs Formation, just above a sharp contact with underlying shale of the Arctic Bay Formation. Showings here are dominated by galena, with variable but lesser proportions of Cu, Ba and Zn minerals. (3) The graben-bounding White Bay Fault zone on the north side of the MIG juxtaposes basement gneiss with platformal carbonate, and was intermittently active during deposition of the Bylot Supergroup. In the eastern MIG, mineralisation is locally present up to 1 km away from the fault, in replacement-style showings that appear to be partly facies-controlled. These showings are sphalerite-dominated, with lesser volumes of galena.

Field work in 2006 focused on one showing documented in assessment reports and district synopses, two showings not documented in any material submitted for assessment, and one locality that is critical to understanding the four-dimensional facies evolution of the graben and its base metal distribution. One new Cu showing was discovered.

MONITORING A SUB-ARCTIC LAKE TROUT POPULATION TO DETERMINE POTENTIAL TDS EFFECTS FROM A DIAMOND MINING OPERATION AT SNAP LAKE

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De Beers Canada Inc. has developed a comprehensive aquatic effects monitoring program for the Snap Lake Project. Primary project related changes expected for the Project are a gradual increase in total dissolved solids and nutrient levels in Snap Lake. One component of the Snap Lake program has been monitoring the population structure of endemic fish in Snap Lake. Currently, the target fish species for population structure evaluations in Snap Lake are lake trout (*Salvelinus namaycush*) and round whitefish (*Prosopium cylindraceum*). These species were selected because they (1) represent different trophic levels yet share similar habitat requirements (2) they are distributed at densities that enable reliable population structure evaluations, and (3) are viewed as representative indicators of the health of the ecosystem. The focus of the 2006 fisheries investigation in Snap Lake was to evaluate the potential to capture a sufficient sample size of different age classes using a variety on non-lethal methods. During a 10 day program, 49 lake trout were captured, of which 44 were juveniles.

SOURCES OF FLUIDS AND ORE COMPONENTS IN IOCG DEPOSITS: CONSTRAINTS FROM THE 1.6-1.5 GA SYSTEMS IN CLONCURRY DISTRICT, NW QUEENSLAND

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The origin of ore fluid components and causes of economic variation in the empirically-defined IOCG deposit class are poorly constrained. The Cloncurry District and its contained ore deposits now represent world's most intensively-studied IOCG setting. There are several economic and many subeconomic IOCG deposits with diverse host rocks, structural settings and alteration patterns. District features include meta-evaporite sequences, regionally-extensive sodic-calcic alteration, and batholithic granitoids. The IOCG deposits are mostly magnetite-rich (low hematite) and have alteration parageneses formed above 400 degrees centigrade. Granite hornblende barometry, structural styles and fluid inclusion evidence imply mineralization occurred in a mid crustal setting.

Oxygen and hydrogen stable isotope data generally indicate ore fluid water originated in magmas or had equilibrated with metamorphic rocks at elevated temperatures. Data from the Mount Elliott deposit (which contains intra-ore trachyandesite intrusions), display a deuterium depletion trend that is best explained as a product of magmatic degassing. In contrast to hematitic systems including Olympic Dam in the Gawler Craton of South Australia, these data do not lend support for significant involvement of surficial waters.

PIXE analyses of individual high salinity fluid inclusions from a giant Cu and Au poor magmatic-hydrothermal magnetite deposit at Lightning Creek reveal very high Cu-contents and typical magmatic Br/Cl ratios. Indirect evidence suggests these fluids had sulphur contents too low for copper deposition. High salinity inclusions from the Cu-Au ore deposits have lower Cu-contents and variable Br/Cl ratios ranging down to values compatible with salinity derived from evaporitic salt.

Recent research undertaken within Australia's Predictive Mineral Discovery Cooperative Research Centre using various microanalytical techniques and irradation mass spectrometry has been released in the last few months (Baker et al., 2006; Fisher et al., 2006, Kendrick et al., 2006). Expanded data sets including Cl-Br-I and noble gas analyses of fluid inclusion populations strengthen the evidence for mixed sources of salinity and suggest there are fundamental differences between the ore systems. The largest deposit, Ernest Henry, gives a distinct magmatic signature mixed with one derived from crustal fluids that are interpreted to have assimilated evaporitic chlorine (Kendrick et al., 2006). On the other hand, the geochemistry of fluids from the Osborne deposit, which predates the regional granitoids, does not require the involvement of a magmatic component (Fisher et al., 2006).

The overall picture emerging from this single IOCG district is that ore genesis involved multiple sources of both fluid and salinity and that the ore-forming ingredients were not the same in every case. The data are compatible with the possibility that the largest Fe ± (Cu-Au) deposits had a substantial magmatic contribution.

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EKATI – DRILLING IN THE CANADIAN ARCTIC – A JOURNEY OF CONTINUOUS SAFETY IMPROVEMENTS

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Drilling by its very nature is a specialized occupation. Most mining companies employ highly skilled contractors to undertake their drilling programs. Through the years, drilling equipment has remained virtually unchanged, as have the associated hazards. In part, this was driven by mining and exploration companies themselves. Drilling contractors were only employed for short periods, and focused on production, with other considerations being secondary.

At BHP Billiton we strive to achieve “Zero Harm” to our people, environment, impact communities, and encourage the wise use of natural resources. At EKATI we embarked on a two year journey with our drilling contractors and arrived with major step changes in our drilling activities.

Through diligent efforts of our drilling teams we have eliminated a number of hazards from drilling operations. Some of these changes involved equipment changes; however the greater impact to hazard elimination comes from the people working on the drills. The crews are best equipped to identify hazards, and develop practical controls for these.

There is no doubt that the mining industry as a whole is demanding safer work practices. As a result of incorporating safe work practices, overall costs can be reduced, drilling production increased, and employee job satisfaction and performance increase. There are fewer disabling injuries, fewer minor injuries, and better near miss reporting.

Hazard awareness and elimination are key to achieving “Zero Harm”.

CHANGING FACE OF THE NORTHWEST TERRITORIES' MINERAL WEALTH

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In 1776, Adam Smith saw wealth creation as the combination of materials, labour, land, and technology in such a way as to capture a profit. Mineral wealth in the modern era, as suggested by Jim Cooney (2001), however, consists of four components: wealth creation, wealth distribution, environmental impact, and community progress.

The Northwest Territories (NWT) is blessed with an enormous mineral and petroleum endowment. Mining companies around the world have ranked the NWT the first place in the world for mineral potential. With modern technology and higher prices for oil and natural gas, the North is also attracting a growing number of petroleum producers. Considerable exploration and development is underway, especially in the southern part of the territory. Landowners, mining companies, governments, and the general public are working together closely to maximize the mineral wealth from the mineral development for all stakeholders. Progress has been evident in all fronts: In 2003, the Tl'icho Land Claim Agreement was successfully signed to bring the total Land Claim Agreements to four; Agreements with the Dehcho, the Akaticho and the NWT Métis Territory are in process. Resource revenue sharing mechanisms have been incorporated into a number of Final Agreements – the Gwich'in, the Sahtu, the Tl'icho and the Dehcho Interim Measures Agreement.

Mineral exploration expenditures in 2006 are expected to reach $128.7 million, twice as much as that in 2003; As of the end of September 2006, over 40 million acres of prospecting permits have been taken out for mineral exploration; Oil and gas companies' capital expenditures in 2005 also reached $500 million. The total minerals, and oil and gas extraction in recent years accounted for more than half of NWT's GDP; even the exploration companies' NWT spending reached 66% based on a 2004 survey. In addition, mining and petroleum companies have enhanced their environmental stewardship; With regard to community progress, mining companies have signed three Socio-Economic Agreements with the Government of the Northwest Territories (GNWT) and a number of Impact Benefit Agreements (IBA) with the affected communities to provide employment, training and other benefits. Such socio-economic benefits are also seen in the oil and gas sector. The unemployment rate in the NWT in 2005 reached 5.4%, the lowest in the past five years. The Government of the Northwest Territories also tried to improve the mining investment climate by reducing the corporate income tax from 14% to 11.5% effective July 1, 2006.

With improved mining investment environment, increased mineral exploration and mining activities, better wealth distribution mechanisms, mining companies' enhanced environmental stewardship and corporate social responsibility, and improved community development, the

NWT is in the era enjoying the full benefits of mineral wealth. The NWT is marching toward a better tomorrow.

POSTERS

PRELIMINARY INVESTIGATIONS OF THE UPPER DEVONIAN TO LOWER CARBONIFEROUS TUTTLE FORMATION, EAST RICHARDSON MOUNTAINS, YUKON

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Field investigations of Upper Paleozoic strata on the eastern flanks of the Richardson Mountains during summer 2006 were part of the multi-year "Regional Geoscience Studies and Petroleum Potential, Peel Plateau and Plain, Northwest Territories and Yukon" project, launched in 2005. Yukon studies were conducted in the Trail River map area (NTS 106L) and the northern portion of the Wind River map sheet (NTS 106E).

The focus of the investigation was the Upper Devonian to Lower Carboniferous Tuttle Formation which historically has been an exploration target for oil and gas. Five Yukon wells and one NWT well have had minor gas shows in the Tuttle.

Objectives of the 2006 fieldwork were 1) to locate exposures of the Tuttle Formation and neighbouring units at various localities along the east Richardson Mountains; 2) to measure stratigraphic sections of the Tuttle, where accessible; 3) to determine the stratigraphic position of the Tuttle Formation; 4) to compare outcrop characteristics of Tuttle with subsurface drill core; and 5) to sample the Tuttle Formation and neighbouring units for age determination, source rock potential, thin section, porosity/permeability and thermal maturation studies. Data collected will be used to enhance future petroleum resource assessments of the Peel region.

Exposures of the Tuttle Formation were limited to outcrop on the Trail River, Road River and along a north-trending ridge in the vicinity. No complete sections of the Tuttle were identified in the study area and sections were complicated by local folding and faulting. Approximately 100 m of Tuttle was measured in detail. On the Trail and Road rivers, the Tuttle Formation cropped out as two resistant ribs comprising mainly sandstone, with subordinate conglomerate, separated by largely covered intervals that are interpreted as fine clastic rocks (likely shale). Shale dominated packages directly above and below the Tuttle coarse clastic packages were also examined.

LITHOGEOCHEMISTRY OF VOLCANIC ROCKS AND THE ASSOCIATION WITH CU-U MINERALIZATION IN THE FAB LAKE REGION OF THE GREAT BEAR MAGMATIC ZONE, NWT

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This petrologic study, part of the South Wopmay Bedrock-mapping project, is investigating a sequence of 1860 Ma subvolcanic and volcanic porphyries at Fab Lake in the Great Bear Magmatic Zone of the northwestern Canadian Shield. These porphyries and associated plutons have long been considered as part of continental magmatic arc. The purpose of this study will be to show how these magmas were generated, and decipher the extent of contamination and assimilation of older crustal rocks. The secondary purpose of this study is to investigate the abundance of PGEs in spatially and temporally-related Cu-U mineralization in the Fab Lake area. To accomplish this, 29 relatively unaltered samples were collected during regional mapping. The majority of samples were taken from the Fab Lake area, approximately 12 km east from the community of Gameti; others were taken from Sue-Dianne and Beaver Lodge Lake for comparison. Six highly altered or mineralized samples were collected from trenches over Cu-U mineralization near the eastern edge of Fab Lake. All samples will have 1-2 polished thin sections prepared for petrography and all are currently being analyzed for major and trace elements, including PGE and Au. Dependant upon the geochemical results 5-10 least-altered samples, with different geochemical signatures, may be analyzed for their Pb, U-Pb, Re-Os and Sm-Nd isotopic compositions.

Field observations indicate the porphyries lie topographically higher than, and are interpreted to have been intruded by, the surrounding granite and quartz monzonite plutons. Minor sporadic alteration occurs throughout the study area and locally intense alteration is common in areas associated with Cu-U mineralization. Preliminary petrography indicates that the porphyries are felsic to intermediate in composition. The rocks comprise 5-30 volume% zoned plagioclase phenocrysts in a fine-grained, felsic to intermediate matrix. Other common phenocrysts include quartz, hornblende, pyroxene and magnetite. Primary zoning in plagioclase phenocrysts is well preserved, despite common saussuritization. Ferromagnesian minerals are largely replaced by hornblende and chlorite. Alteration is most significant along microfractures. The lithogeochemical results, in combination with detailed petrography, will be used to constrain both the petrogenesis of the magmatic suite and the metasomatic processes associated with Cu-U mineralization.

REGIONAL AND THEMATIC APPLICATIONS OF LAM ICP-MS U-PB GEOCHRONOLOGY WITH SPECIFIC FOCUS ON CONSTRAINING THE SEQUENCE OF MAGMATISM AND ASSOCIATED IOCG-RELATED ALTERATION AT DE VRIES LAKE, SOUTHERN WOPMAY OROGEN, CANADA.

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We present Back Scattered Electron (BSE) images and U-Pb isotopic datasets determined by Laser Ablation Microprobe Inductively Coupled Plasma-Mass Spectrometry (LAM ICP-MS) for zircon populations from 10 representative magmatic units and 3 metasedimentary units from the southern Wopmay Orogen. Three plutons sampled from east of the Wopmay fault zone range in age from Neoarchean (2582±4 Ma upper-crustal granite) to Paleoproterozoic (Peri granite − 1882±4 Ma, alkali feldspar granite − 1865±4 Ma). Seven intrusions from the Paleoproterozoic Great Bear magmatic zone yielded the following ages: a syntectonic granitic dyke that intrudes the Treasure Lake Group (1878±4 Ma), quartz-feldspar porphyry (1877±3 Ma), hornblende-porphyritic granite (1874±3 Ma), diorite (1872±4 Ma), hornblende-magnetite granite that represents a northern extension of the Marian River batholith (1864±3 Ma), an aplitic dyke (1866±5 Ma), and a rapakivi granite (1860±4 Ma).

Samples for detrital zircon analysis were collected from three metasedimentary sequences in the southern Wopmay Orogen: a quartzite from the Snare Group, a sillimanite-bearing pelite from the metamorphic internal zone, and an arkose of Treasure Lake Group affinity, which has experienced IOCG-related alteration. Detrital zircons from the Snare Group quartzite yielded no Proterozoic ages. Major U-Pb age peaks occur at ~2717, 2680, 2660, 2620, and ~2600 Ma. U-Pb results for the sillimanite -bearing pelite from the metamorphic internal zone of the Wopmay Orogen reveal a predominant Archean provenance (six populations between ~2705 and 2510 Ma with major peaks at ~2600 and 2575 Ma) and several subordinate populations of Paleoproterozoic zircon (peaks at ~2450, 2410, and 2315 Ma). Detrital zircon spectra for the arkose from the Treasure Lake Group also indicate both Archean and Paleoproterozoic sources, with six Archean peaks between ~3120 Ma (minimum age) and ~2570 Ma, and four Paleoproterozoic peaks between at ~2490 and 1885 Ma. A concordia age for the youngest concordant population yielded 1884±6 Ma, which is interpreted as the maximum age for the onset of sedimentation. Collectively, these U-Pb datasets reveal that the Wopmay Orogen is composed of structurally interleaved Archean and Paleoproterozoic lithologies. Discovery of a Neoarchean (~2580 Ma) upper-crustal granite in the metamorphic internal zone raises an important question with respect to the extent of Archean basement at the surface and at depth within Wopmay Orogen. With respect to the Great Bear Magmatic Arc, the data show that large volumes of magma were emplaced over a period of ~20 My (~1880-1860 Ma) and that magmatism was accompanied by widespread fluid activity and deformation. At De Vries Lake, U-Pb age data demonstrate that several magmatic phases postdate a major IOCG alteration event with distinct calcic, sodic and magnetite alteration assemblages, suggesting that fluid activity responsible for extensive alteration and local mineralization occurred prior to the intrusion of the

voluminous ~1867 – 1860 Ma magmatism. Collectively, the datasets demonstrate the versatility and effectiveness of U-Pb dating by LAM-ICP-MS and indicate that the method is capable of achieving sufficient accuracy and precision to assist in resolving regional and thematic geologic problems.

A GIANT QUARTZ VEIN AT NICO GREAT BEAR MAGMATIC ZONE, NORTHWEST TERRITORIES

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Currently, there is much interest in mineral exploration projects in Northern Canada. In the southern Great Bear Magmatic Zone (GBMZ) there are two advanced exploration projects; NICO, a Co-Au-Bi deposit of 42Mt, and Sue-Dianne, a Cu-Ag deposit of 17Mt. The GBMZ is underlain by a series of Paleoproterozoic calc-alkaline intrusive and extrusive rocks and is transected by the North-South trending Wopmay Fault. Subsidiary northeast trending faults may have acted as conduits for hydrothermal fluid flow and resulted in giant quartz veins and stockwork zones. Approximately 80 giant quartz veins and stockwork zones of unknown age and origin are found in the GBMZ. These quartz vein zones can be up to 100 meters wide and 10 kilometers long, and are often spatially associated with mineralization. Examples of these giant quartz veins occur at both NICO and Sue-Dianne, while other veins have hosted uranium deposits. Some of the quartz veins, however, are barren. To date, there has been little information on the origins of the veins and their relationship to mineralization. Whether the veins represent a regional, or discrete fluid flow event(s), is currently unknown.

This preliminary presentation will focus on the quartz veining at NICO. NICO is located in the southern part of the GBMZ and is related to a post-collisional plutonic terrane containing ca. 1867 Ma continental volcanic rocks and ca. 1860 Ma A-type rapakivi granite plutons. The host rocks at NICO are altered tuffaceous lapilli flows and heterolithic breccias. The zone of quartz veining at NICO is located North of the main ore body and forms a topographic high. The vein zone is 30-50 meters wide by approximately four kilometers long and trends 050º. The first phase of veining consisted of a quartz stockwork, which contains cloudy fine-grained quartz, ample vuggy porosity, and brecciated wallrock fragments that have been significantly silicified. A later stockwork event consists of veins with epithermal textures including euhedral zoned quartz crystals and crustiform banding. Both generations of veins are hematite stained. Quartz veins present in drill core were also examined. These veins have similar textures to those found in outcrop but contain bornite, chalcopyrite, arsenopyrite, hematite, and magnetite. Sulphide mineralization is found as individual stringers within quartz veins, within the host-rock, or at the contact of the vein and the wall-rock.

This study will form part of a M.Sc. thesis that is examining the origins of a sub-set of mineralized and unmineralized quartz stockworks in the GBMZ in order to assess if the fluid flow events are indeed related on a regional scale. A geochemical and microthermometric study will be carried out on a sub-set of the vein systems to ascertain the pressure, temperature, and composition of the vein fluids. This data will be used to assess if the veins are in fact part of a mineralizing system in the GBMZ. This will provide new insights into these large hydrothermal systems, and their association with economic minerals, aiding future exploration in the Great Bear Magmatic Zone.

GARNET PERIODITE MICROXENOLITHS FROM A154, DIAVIK DIAMOND MINES

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Studies on garnet xenocrysts conducted by Griffin et al. (1999) indicate the presence of a sharp compositional discontinuity in the lithospheric mantle beneath the central Slave Craton, with the shallower layer being highly depleted and the deeper layer being more fertile. In order to test this hypothesis, we analyzed 74 peridotitic micro-xenoliths from the A154-S pipe at Diavik Diamond Mines, located in the Lac de Gras region, NWT. We used micro-xenoliths instead of xenocrysts because polymineralic xenoliths allow application of more accurate mineral exchange geothermobarometers. The sampled micro-xenoliths range from 0.5 to 2 cm in diameter and are mostly bi-mineralic, dominated by garnet-clinopyroxene and less abundant garnet-orthopyroxene, and garnet-olivine assemblages. Mg-chromite was observed as an additional phase in a few xenoliths. Xenolith garnets are classified as G1 (Low-Cr megacrysts; 10% of xenoliths), G10 (harzburgitic; 11%), G9 (lherzolitic; 44%), G12 (wehrlitic; 1%) and G11 (high-Ti peridotitic; 34%), following the classification scheme of Grütter et al. (2004).

Geothermobarometry based on garnet-orthopyroxene exchange equilibria gives a range of pressures and temperatures from 3.5-5.6 GPa and 810-1120°C, with the majority of samples falling between 3.5-5.0 GPa and 900-1100°C, consistent with a geothermal gradient equivalent of 38mW/m^2 surface heat flow. Single clinopyroxene thermobarometry indicates P-T conditions of 3.3-5.2 GPa and 720-1140°C with the majority of the P-T data plotting in the range of 3.2-4.9 GPa and 700-950˚C. The combined data set may be interpreted to indicate a stepped geotherm, as originally proposed by Griffin (1999), increasing from about 36mW/m^2 at shallower depth to 38mW/m^2 at greater depth. The transition from lower to higher heat flow values takes place between 4.0 and 4.5 GPa and appears to be gradational. The total pressure range derived from geothermobarometry suggests a lithospheric thickness of at least 170km. Projection of Ni-in-garnet temperatures on this stepped geotherm results in a similar maximum depth.

The trace element composition of xenoliths garnets was studied to assess both the extent of chemical depletion and possible effects of secondary metasomatic re-enrichment. A number of

samples show variable degrees of depletion in the middle and/or heavy REE commonly accompanied by re-enrichment in light REE. Such REE patterns are typical for overall moderate degrees of metasomatic overprint of depleted peridotite compositions. The majority of garnets, however, had REE patterns similar to garnets from primitive mantle compositions. Such REE patterns have been shown elsewhere to indicate complete re-fertilization of the trace element budget of mantle peridotites, with a depleted signature still being visible in the major element composition. We also employed the Ti content of garnets as an alternative measure for the degree of re-fertilitization. The maximum TiO_2 content in garnet increases with temperature (and by implication with depth) from below the limit of detection at 800-900˚C to about 7000 ppm at 1100˚C. Our new data therefore confirm the presence of an upper depleted layer in the lithospheric mantle beneath Lac de Gras but indicate that the change to a more fertile deeper layer takes place gradually and not along a sharp discontinuity.

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URANIUM IN NUNAVUT

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Nunavut possesses exciting new and revisited uranium exploration plays, stimulated by promising geological settings, a high commodity price and predicted worldwide energy shortage. The strongest focus is on unconformity-associated and sandstone-hosted models for Proterozoic basins, and magmatic-hydrothermal iron oxide copper gold (IOCG) systems in Proterozoic volcano-plutonic belts. Nunavut exploration is driven by significant prospects that display similarities with world class deposits in the Athabasca Basin of Saskatchewan and basins in northwestern Australia. Exploration efforts are also directed toward paleoplacer, vein, and volcanic uranium deposit types.

The Nunavut mineral occurrence database (NUMIN) is being updated from Geological Survey of Canada databases for uranium (as well as for gold, Ni-Cu-PGE, and kimberlite). The Canadian Uranium Database, which is used here to illustrate the distribution and fundamental affiliation/classification of uranium occurrences in Nunavut, is designed to capture geological parameters such as commodities, mineralization style, mineralogy, coincident features, shape, host rocks, geological and isotopic ages, geochemical and geophysical signatures, references, and qualified free-text comments. Data acquisition has been accelerated by a partnership between Indian and Northern Affairs Canada (INAC) and Natural Resources Canada (NRCan) aimed at completing the Nunavut-wide coverage, improving the accuracy of location and resource data, integrating new knowledge of geology and deposit models, and porting these data

into NUMIN. This in turn will contribute to a national uranium resource assessment being conducted under the Secure Canadian Energy Supply Program of Natural Resources Canada.

Uranium occurrences are clustered in specific geological settings. Unconformity-related deposits are spatially associated with the basal unconformity of Proterozoic basins that range in age from ca 1.8 to 1.5 Ga. Some are entirely basement hosted (e.g. the Kiggavik trend); others are at the -unconformity (e.g. Boomerang Lake of southwestern Thelon Basin). Each setting has specific alteration types (e.g. clay minerals, silicification, and dissolution), structural attributes (e.g. intersecting, reactivated faults) and corresponding geophysical signatures (e.g. conductors, magnetic lows, density lows). Conceptual models involving redox systems or Eh-pH changes in the fluids carrying uranium require geochemical traps such as graphitic conductors or mafic basement units. Such attributes are captured in the database if available.

Proterozoic sandstone-hosted deposits are located at or near stratigraphic interfaces between oxidized sandstone and reduced fine-grained strata, and along reactivated fault zones (e.g. Mountain Lake deposit of the Hornby Bay Basin). Prospects of the Baker Lake Basin are within alteration corridors in Kazan Formation sandstone beside mafic dykes. Paleoplacer uranium deposits are sought in basal Proterozoic sequences such as the lower Hurwitz Group, by analogy with deposits at the base of the Huronian Supergroup of Ontario. Skarn-like, uraniferous, polymetallic occurrences at Sandybeach Lake are in a carbonate-bearing metasedimentary sequence at or near intrusive granite contacts.

This work was initiated in 2004 as part of the Western Churchill Metallogeny Project, Northern Resources Development Program, with partial funding by INAC – Nunavut Regional Office aimed toward public access via NUMIN. The public will soon be able to search and display uranium and other mineral occurrences in Nunavut under the NUMIN Showings link through the NunavutGeoscience.ca website

GOLD IN NUNAVUT

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Nunavut possesses three significant gold deposits that are advancing towards production (Doris North, Meadowbank and Tiriganiaq), as well as numerous exciting exploration plays (Hope Bay belt, Committee Bay belt, Matrix, Ayak-Jaeger, and others). The principal exploration targets are iron-formation (BIF)-hosted and vein-related gold in Archean supracrustal belts in both Slave and Western Churchill provinces, and paleoplacer gold of probable Paleoproterozoic age in Western Churchill.

A Geological Survey of Canada gold database for the Churchill and Slave geological provinces, used here to illustrate the distribution and affiliations of gold occurrences across Nunavut, is

designed to capture geological parameters such as commodities, mineralization style, mineralogy, coincident feature, shape, host rocks, geological ages, geochemical and geophysical signatures, sample chemistry, and references. Data acquisition has been accelerated by a partnership between Indian and Northern Affairs Canada (INAC) and Natural Resources Canada (NRCan) aimed at completing the Nunavut-wide information coverage, improving the accuracy of location data, integrating new knowledge of geology and deposit models, and porting these data into INAC's Nunavut Mineral Showings Database (NUMIN). Information derived from the Churchill and Slave gold database is being used in a case study to help develop a methodology for mineral resource assessment in northern Canada. A variety of preliminary gold potential maps for central Western Churchill Province have been generated to date, including maps for BIF-hosted and vein-related gold.

Significant examples of BIF-hosted gold in Nunavut include Lupin (former world-class producer), George Lake - Goose Lake, the Cullaton B Zone (past producer), Meadowbank, Malrok and Ridge Lake on Baffin Island, as well as several along the Meliadine Trend (Discovery, Tiriganiaq, Wolf, and others) and along the Committee Bay belt (Three Bluffs, Lowlands, Inuk, and others). Of these, only the Baffin Island examples are hosted by iron-formation that is Proterozoic in age, the rest being Archean. Vein-related gold is the principal style in the Hope Bay belt (Doris North, Boston, Madrid, and others), the High Lake belt (Ulu), and the Kaminak belt (Turquetil, Cache, Fat Lake, Shear Lake and others), and is important in the Woodburn belt (Vault, Sheba, and others) and along the Meliadine Trend (Tiriganiaq and others). Vein-related gold can be usefully subdivided into gold-only and polymetallic subtypes. Many examples of the gold-only subtype can be classified as orogenic gold deposits linked to late structures that formed at mid-crustal levels. Some examples of the polymetallic subtype are similar to epithermal, porphyry and/or intrusion-related deposits linked to magmatic activity at shallow crustal levels. Paleoplacer gold, hosted just above the unconformity between Archean basement and younger supracrustal rocks that include pyritic quartz-pebble conglomerates similar to those of the Witwatersrand, has been identified at numerous locales in the Padlei area, including the Matrix property.

This work was initiated as part of the Western Churchill Metallogeny Project, Northern Resources Development Program, with partial funding by INAC – Nunavut Regional Office aimed toward public access via NUMIN. The public will soon be able to search and display gold and other mineral occurrences in Nunavut under the NUMIN Showings link through the NunavutGeoscience.ca website.

THE MACKENZIE VALLEY LANDSLIDE SPATIAL DATABASE - VERSION 1.0 AND ASSOCIATED LANDSLIDE CASE STUDIES, NORTHWEST TERRITORIES, CANADA

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In the recent geological history of the Mackenzie Valley, hundreds of landslides, often affecting areas several hectares in size, have been identified and mapped. In 2000, a first landslide inventory compiled from air photos (1947 – 1987) was completed in the western Mackenzie District and Yukon. However, no detailed inventory has been compiled for the new proposed gas pipeline route between Inuvik (68.35°N, 133.72°W) and Tulita (64.90°N, 125.57°W) and, more importantly, no regional studies have been completed depicting the regional landslide hazards along this corridor. To fill the data gap, Natural Resources Canada initiated a regional landslide mapping project to provide baseline knowledge on types, regional distribution, and control of landslides in the Mackenzie Valley through a compilation of existing and new information. The preliminary Mackenzie Valley Landslide Spatial Database will be presented as well as a detailed description of three case studies.

The Mackenzie Valley Study Area (MVSA) encompasses a corridor extending 20 km to either side of the Inuvik - Tulita section of the new proposed gas pipeline route, for a length of 540 km and an area of 24,000 km^2. The MVSA also includes the Ramparts and the Thunder River regions, both known for widespread landsliding. The MVSA is characterised by cold winters with low precipitation and relatively warm summers with moderate precipitation. The vegetation cover is dominated by coniferous forest (medium to low density) and wetland/shrub land near Inuvik. The MVSA is covered by unconsolidated sediments (99%), which are dominated by morainal (60%), lacustrine (18%), and alluvial (10%) deposits. Three types of permafrost were mapped: continuous, extensive discontinuous, and intermediate discontinuous.

Using classical air photo interpretation techniques, a preliminary inventory of 1,807 landslides and other natural terrain hazard features has been mapped using 665 coloured air photos (scale of 1:30,000) acquired in 2004. These air photos cover approximately 40% of the entire MVSA, i.e. a corridor of 15 km wide along the proposed gas pipeline route between Inuvik and Tulita. Following the photo interpretation, 182 of the 665 air photos that contained at least one landslide were orthorectified. The orthophotos were used in a GIS platform to trace the landslide limits where the landslide attribute table was joined to create the Mackenzie Valley Landslide Spatial Database – Version 1.0. For each database entry, the following attributes were recorded: unique identifier, 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 number. A collection of several hundreds of photographs of landslides, taken while carrying out field surveys in 2005 and 2006, completes the database.

From the database attributes, desktop landslide mapping and statistical analyses were performed to characterise the landslide distribution. The 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 (25%). Rock falls (10%), debris flows (10%), earth slides (9%), surficial landslides (6%), and retrogressive thaw slides (5%) are second in order of importance. About 46% of all landslides took place in morainal deposits, 19% in lacustrine sediments, 14% in bedrock, and 13% in glaciofluvial sediments. The relative age of landslides was estimated based on tone, texture, and vegetation re-growth parameters, where 39% were classified old (>50 years old), 39% intermediate in age (10-50 years old), and 22% recent (<10 years old).

COHERENT TARGETS FOR INTERFEROMETRIC SAR TO MONITOR UNSTABLE PERMAFROST SLOPES IN THE MACKENZIE VALLEY, NORTHWEST TERRITORIES.

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Northern communities and infrastructure in the Mackenzie Valley may be impacted by landslides and slope movements. Hundreds of new and reactivated landslides have been recently mapped by Natural Resources Canada along a new proposed pipeline corridor (see abstract by Couture & Riopel in this volume). A wide range of geotechnical tools are available to characterize and monitor landslides. However, in remote, harsh, and permafrost environments, monitoring of landslides and slopes showing on-going displacements is a difficult challenge. Furthermore, the cost associated with regular site visits may become prohibitive. As a solution, remote sensing techniques (e.g. satellite SAR and optical images, Lidar, InSAR) have been applied to landslide hazard environments more frequently in the last decade. Amongst them, the application of interferometric techniques (InSAR: Interferometric Synthetic Aperture Radar) to monitor landslides has been developing rapidly. In some cases, interferometric techniques can become the unique provider of new quantitative data.

The problem of sustaining satellite scene coherence can be a significant issue for analyzing and interpreting SAR images. For natural targets, vegetation, ground conditions, soil properties, change rate, spaceborne sensor geometry and acquisition rate are among factors which can influence the scattering properties and destroy coherence of scene between satellite passes. Without pass-to-pass scene coherence, there is no possibility of making interferometric measurements. Man-made targets (corner reflectors) are phase coherent pass to pass and thus can represent the position changes of the underlying scene (e.g. active slopes). This is a variation of the familiar permanent scatterers method which has been developed lately by various researchers as a refinement of the standard interferometry.

A set of aluminium-made trihedral core reflectors have been successfully deployed for the first time in Canada to monitor permafrost slopes affected by landslides in the Mackenzie Valley. Ten corner reflectors have been installed at or in the vicinity of three landslides situated in an adjacent valley east of the Thunder River valley, about 120 km southeast of Inuvik. This area encompasses a section of the new proposed gas pipeline route, from the Mackenzie Delta to

Alberta. These corner reflectors are used because i) they are simple device to manufacture, ii) they have large radar cross sections for their physical size (about 1x1x1m), iii) they have wide angular acceptance angles, and iv) they are reasonably easy to deploy.

This poster briefly presents the coherent target InSAR technique, the deployment of corner reflectors, their anchoring systems developed specifically for the permafrost environment, the local slopes and landslide conditions, as well as the challenges and issues of deploying corner reflectors and analyzing data from coherent target InSAR.

AN EMPIRICAL CHROMITE CLASSIFICATION FOR DIAMOND EXPLORATION

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Spinel is a ubiquitous accessory mineral in igneous rocks and, because of its strong resistance to weathering, is commonly recovered in till and stream samples during diamond exploring. The application of chrome-bearing spinel to exploration has been limited by the commonality of spinel compositions from a wide diversity of mafic and ultramafic igneous rocks. The usefulness of chromite as an exploration tool may be unlocked by defining simple compositional fields or trends that allow reliable source identification based on a statistical sample set.

We have examined a database of over 16,000 chromite analyses primarily from the dataset of Barnes and Roeder (2001) but also including other published and unpublished data. From this database, we identified four fields of chromite compositions that can be used to uniquely distinguish chromites as (i) inclusions in diamonds, (ii) ultramafic, (iii) basaltic, and (iv) kimberlitic. Similar to observation by Fipke et al. (1995), chromites included in diamonds lie in a relatively restricted field of high Cr_2O_3 (60 to 70 wt%) with Mg-numbers ($100*Mg/[Mg+Fe^{2+}]$) ranging from 50 to 80. This field describes 96% of diamond inclusion chromites in our database of 814 analyses. Remaining spinels are classified based on trends in a plot of TiO_2 versus MgO. Chromites from broadly basaltic bulk compositions (>13,000 analyses) have high titanium concentrations at low magnesium and decrease in TiO_2 with increasing MgO according to an exponential decay curve. The "basaltic" field is defined as the region below (lower Ti) the bounding curve. Spinel-bearing peridotites (~260 analyses) have chromites that fall within the MgO-rich portion of the basaltic field. An approximate cut-off between basaltic and ultramafic spinels is defined at 12.7 wt% MgO, based on the average MgO concentration (15.1 wt%) of peridotitic spinels minus one standard deviation (2.4 wt%). This cut-off includes 84% of peridotitic samples into the ultramafic field. A unique compositional trend of groundmass spinels in Group 1 kimberlites (trend 1 of Mitchell, 1986) also enables identification of kimberlitic spinels in the TiO_2 vs. MgO plot as they trend towards high titanium (plotting above the bounding curve) at relatively high MgO. This trend is not observed in any other rock type and is a simple and efficient tool for kimberlite indicator mineral assessment.

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ITRAX™ CORE SCANNER: A CUTTING-EDGE ANALYTICAL TOOL TO REFINE ALTERATION VECTORS TO IOCG-U AND OTHER DEPOSIT TYPE MINERALIZATION

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The ITRAX™ core scanner is a new XRF instrument that provides in situ millimetre to micrometre-scale optical, radiographic and chemical mapping of major, trace, rare-earth (REE), platinum group (PGE) and high-field strength (HFSE) elements along cores and samples of rocks and sediments. A non destructive X-ray beam focused through a flat capillary waveguide is used for X-radiography and X-ray fluorescence (XRF) analysis of the samples as they lie flat on a moving tray above the beam. For an X Ray molybdenum tube, elements analyzed cover the range from silica to uranium with detection limits down to 20 ppm for most elements, depending on the elements, counting time and matrix composition. This cutting-edge equipment at INRS-ETE is unique in Canada and is among only three locations in North America. Analysis is non destructive and can be incrementally performed every 100 microns. As a case study, we have obtained chemical concentration profiles every 500 microns with 30 seconds of analysis time, across pervasive hydrothermal alteration zones and veins from the polymetallic iron oxide copper-gold (Co-Ag-Bi-U) (IOCG) Contact Lake Belt of the Great Bear Magmatic Zone, NWT. Many elements analysed in this IOCG system were abundant enough for their profile to be significant without detailed reprocessing. These include Si, S, Cl, K, Ca, Ti, Mn, Fe, Cu, Se, Rb, Sr, Zr, and Y. Checking of individual analysis confirmed the presence of Au, Pt, Bi and U where profiles display significant peaks. In contrast, Ni, Cr, V, As, Ba, Hg, Pb could not be distinguished easily from background. Finally, the abundance of K precluded the detection of Ag, though none of the samples could be shown to have any in the first place. This is the first application of the ITRAX™ core scanner for such complex material and already the potential in exploration is clear. With time, data reprocessing should speed up interpretation and lead to quantitative analysis. In this mineralizing system, the exceptional field exposures allow sampling of key alteration types and overprinting relationships. Integrated to field relationships, the spatially detailed geochemical fingerprinting will provide a means of tracing chemical evolution of many detectable elements involved in IOCG systems (excluding Na and F) from least altered to intensively altered rocks. Knowledge of when and where significant Cu, Au, U, PGE and other commodities appear in a system will enhance our ability to conduct vectoring analysis to IOCG-U deposits and refine exploration criteria for the complex systems that host them.

PEEL RIVER WATERSHED SAMPLING PROGRAM: WATER AND SUSPENDED SEDIMENT

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The Peel River is a transboundary river which originates in the Yukon and flows into the Northwest Territories and past Fort McPherson. The river eventually joins the Mackenzie River, approximately 65 km south of Aklavik, NT. The Peel River supports the subsistence lifestyle of numerous residents within and around the area including the Tetlit Gwich'in, the Nacho Ny'a'k Dun and the Tr'on Dek Hwech'in.

To meet the requirements of the Transboundary Water Management Agreement between the Yukon and the Northwest Territories, the Water Resources Division monitors the Peel River to ensure that the ecological integrity of the aquatic ecosystem is preserved for current and future generations. The purpose of the Agreement is to cooperatively manage, protect and conserve the waters common to the Yukon and NWT while facilitating sustainable use of the transboundary waters.

The Peel River Watershed has widespread hydrocarbon potential with current and impending oil and gas exploration which warrants a better understanding of baseline chemistry. Water and suspended sediment samples were collected to understand and develop a baseline of water and sediment quality conditions as well as to address community concerns about possible contaminants in the Peel River. Water samples were analyzed for physical parameters, nutrients, major ions and metals. Suspended sediment samples were analyzed for routine parameters as well as organic compounds including organochlorines (such as DDT and herbicides), PCBs and hydrocarbons. The data collected from this study can be used to help detect changes in water quality due to future anthropogenic disturbances or natural phenomena. It is hoped that the Peel River Basin study will contribute to the understanding of water quality in this important northern watershed.

SURFICIAL GEOLOGY RESEARCH PROGRAM IN THE SOUTHERN MACKENZIE VALLEY: APPLICATION TO THE PROPOSED GAS PIPELINE AND RESOURCE DEVELOPMENT

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Surficial geology research conducted by the Geological Survey of Canada in southern Mackenzie Valley during 2005 and 2006 has yielded a large amount of geoscience data, including: surficial geology maps, till geochemistry, geotechnical analyses, drift isopach maps and clast lithology-till provenance studies. Recognizing the pressing need for geoscience data in light of the proposed Mackenzie Valley Gas Pipeline, we have not only undertaken a wide diversity of studies, but also the manner and formats in which this data is being published.

Geological data will be published as follows: A. Digital maps: 1) Surficial geology maps on digital topography at 1:100 000 scale; 2) Radarsat image maps; and 3) Landslide maps linked with a database. B. The fourth product is a CD-ROM containing all of the above mentioned maps, in addition to the geochemical data and drift isopach (thickness) and potential granular aggregate maps. Surficial geology polygons will be linked to sites and their description captured as figures showing stratigraphy accompanied by photographs, sample locations, pie charts of lithology, and geochronological data where possible. In turn, sample numbers will be linked with the geochemical data, age reports, macrofossil reports, etc.

A special emphasis is being placed for the landslide data, and in some areas mapping extends up to 50 km east and west of the pipeline. Till, glaciolacustrine sediments and shale bedrock are most common along the eastern boundaries of the Mackenzie Mountains and plains developed further east: the area covered by this program. Here, postglacial stream incision reaches over 100 metres. Landslide development is most common in particularly where new rivers and minor streams are developed. Landslides formation is widespread and active today, and can change the landscape over the span of a year.

NEW INSIGHT INTO THE TALTSON MAGMATIC ZONE, NORTHEASTERN ALBERTA: EVIDENCE OF A 1.5 GA TECTONOTHERMAL EVENT FROM GARNET PYROXENITE AND MAFIC GRANULITE XENOLITHS

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Representative xenoliths from the Kendu kimberlite pipe in the Birch Mountains kimberlite field, northeastern Alberta, provide insight into the enigmatic Taltson magmatic zone and tectonic history of western Laurentia. Garnet pyroxenite and granulite nodules have a broadly mafic continental geochemical composition. In contrast, the geochemical composition of mafic granulite xenoliths suggests a plagioclase-rich protolith (anorthosite-gabbro).

P-T arrays indicate that garnet pyroxenite, mafic granulite and granulite record similar temperature ranges of between 719º C to 879º C with varying pressures: granulite (7.1-7.9 kbar), mafic granulite (9.6-10.0 kbar) and garnet pyroxenite (13.7-18.7 kbar). Thus, the xenolith suite spans intermediate/high-pressure granulite to granulite-eclogite transition, consistent with depths of approximately 25, 33 and 53 km, respectively.

An age of 1476.2 ± 9.9 Ma is obtained from granulite garnet, clinopyroxene and whole rock using the Sm-Nd geochronometer. This ca. 1.5 Ga age is also evident when using the Lu-Hf isotope system for both the granulite and garnet pyroxenite, and hence, records a previously unreported tectonothermal event in northeastern Alberta. This event ties in with similar ages of continental-scale magmatism, deformation and metamorphism, and is contemporaneous with initial uranium mineralization in the nearby Athabasca Basin.

The generation of these source rocks is interpreted to be a consequence of either underplating or the formation of a diabase dyke complex, during mafic magmatism in the mid-Proterozoic.

REGIONAL TARGETING OF IOCG DEPOSITS IN QUÉBEC

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IOCG deposits formed mainly during Proterozoic and Cretaceous time. The Salobo deposit in Brazil (789 Mt @ 0.96% Cu and 0.52 g Au/t) is the world's only known Archean ore deposit of this type, a fact that opens up many new territories in Canada to exploration, particularly in the Archean Superior Province. Iron oxide deposits constitute giant targets characterized by an abundance of iron as magnetite and/or hematite (100-2,000 Mt @ 35-65% Fe), a vast system of potassic and sodic hydrothermal alteration, a characteristic suite of elements (Cu, Ce, U and Co), and a structural control along major lineaments. These features collectively represent excellent regional-scale geophysical and geochemical targets.

We present an integrated geophysical, geochemical, structural and metallogenic GIS approach at the scale of the province of Quebec and Labrador. The objective is to generate regional exploration targets using data from public databases. The primary exploration guides were as follows: 1) superimposed magnetic and gravimetric anomalies; 2) a suite of indicator elements in stream and lake bottom sediments; 3) proximity to a geophysical lineament or an intersection of lineaments; 4) a spatial association with intermediate to felsic intrusions; and 5) an association

with affiliated deposits (iron-rich skarns, pegmatites and rare element metals associated with alkaline magmatism).

The geophysical approach consisted of isolating positive gravimetric anomalies and then identifying positive magnetic anomalies within the gravimetric signatures. This allowed us to recognize gravimetric anomalies possibly generated by large volumes of iron in the form of hematite and magnetite. The geochemical approach consisted of compiling Cu, Ce-(La), U and Co anomalies from lake bottom sediments in the Far North, part of the Mid North and the Grenville (111,551 samples in total). The geochemical anomalies were determined for each geological province using a threshold value representing the regional background level. The 95th and 97th percentiles were taken as favourable geochemical anomalies. The structural approach was based on an interpretation of geophysical lineaments, in particular the identification of any rectilinear structures interpreted as late brittle faults.

The results obtained demonstrate that the potential for discovering IOCG deposits in Quebec is good. The various approaches recognized the Kwyjibo deposit in the Grenville, which is the only known Proterozoic iron oxide deposit in Quebec. In the Superior Province, punctual geochemical targets along the margins or at the intersection of lineaments west of the Labrador Trough also indicated a potential for this deposit type. Other regional targets based mainly on geological criteria were identified at the periphery of the Proterozoic Wakeham and Mont-Laurier basins (Grenville Province). The intersection of rifts (Ottawa region) and triple point junctions corresponding to ancient Proterozoic aulacogens are also favourable, notably in Labrador (Seal Lake Group) and west of the Labrador Trough (the Lac Cambrien aborted rift).

The study demonstrates that the potential for discovering IOCG deposits in eastern Canada is favourable, and that an integrated geological and geophysical approach can target sectors for exploration using data that is publicly available.

PRELIMINARY INVESTIGATION OF ZINC SHOWINGS HOSTED BY THE SEKWI FORMATION, MACKENZIE MOUNTAINS

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Field investigations of four Zn ±Pb showings in the Mackenzie Mountains, NWT in 2006 addressed controls on base-metal mineralization in the Early Cambrian Sekwi Formation. Sekwi Formation carbonate and minor terrigenous clastic rocks were deposited in open shelf to slope environments on the western passive margin of ancestral North America. The Sekwi Formation is one of the main host units for mineralization in the Mackenzie Mountains Zn district. Zinc and subordinate lead sulphide mineralization in the Sekwi Formation is known from numerous locations along a 300 km trend. Age(s) of the mineralization is not known, and controls on its distribution have not been assessed.

Subtle deformation in the Sekwi Formation at the AB showing on the Nadaleen River map sheet (106C) suggests that replacive and fracture-controlled mineralization may have been influenced by bedding-parallel faults. At the AB C-Zone showing, mineralization is replacive and associated with subvertical faults. At the TIC showing on the Bonnet Plume map sheet (106B), mineralization is replacive and is not associated with any conspicuous faulting. At the Palm showing on the Mount Eduni sheet (106A), property-scale stratigraphic correlation shows that the Palm showing is primarily fault-controlled. The host unit at the Palm Main Zone is unmineralized where it is exposed below the Palm Waterfall Zone, and the host unit at the Waterfall Zone is unmineralized where it is exposed above the Main Zone.

Samples from the four showings, as well as from equivalent but unmineralized Sekwi Formation strata at other locations in the region, will be analyzed. The goals are to determine if there are stratigraphic controls on mineralization, to improve understanding of structural and lithologic controls, and to contribute to the characterization of the ore fluids of the Mackenzie Mountains Zn district.

NEW MULTISENSOR (GAMMA RAY SPECTROMETRIC, MAGNETIC) AIRBORNE AND GROUND GEOPHYSICAL SURVEYS, MACMILLAN PASS – KEELE RIVER AREA, MACKENZIE MOUNTAINS, NWT

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The Sekwi Mountain project initiated by the Northwest Territories Geoscience Office (NTGO) is a 3-year multidisciplinary study to provide a better understanding of the structure, stratigraphy, geochronology, geochemistry, geophysics and tectonic history of a segment of the Mackenzie Mountains.

NTGO recently funded two airborne gamma ray spectrometric and magnetic total field surveys in the Sekwi Mountain area of NWT (NTS 105P). In 2005, two high-resolution helicopter airborne gamma ray spectrometric and total field magnetic surveys were conducted over a 17 by 125 km transect of the Mackenzie Mountains, from MacMillan Pass in the southwest to the Keele River in the northeast. The surveys were designed cooperatively by NTGO and the Geological Survey of Canada (GSC). Survey data for the southwest Sekwi Block has been published as a series of GSC Open Files and NTGO Contributions at 1:50 000 and 1:250 000 scales (Carson et al 2006). Each consists of ten colour interval maps and PDF files including: natural air absorbed dose rate, potassium, equivalent uranium, equivalent thorium, eU/eTh, eU/K, and eTh/K ratios, a ternary radioelement map, a residual total magnetic field map, and a first vertical derivative of the magnetic field map. Survey data for the northeast Canol Block will be published as NTGO Contributions in late 2006.

The two helicopter airborne surveys comprising approximately 6,700 line kilometres were flown along northeast trending flight lines spaced 400 m apart and southeast trending magnetic control

lines spaced 2400 m apart. Sensors included a large-volume gamma ray spectrometric detector (NaI, 33.6 litres downward and 4.2 litres upward looking) sampling every 1 second, and a cesium vapour magnetometer sampling 10 times per second.

This new data provides improved geophysical and geochemical information that will enhance understanding of tectonic and metallogenic aspects of a portion of the Mackenzie Mountains which covers Neoproterozoic to late Devonian sedimentary rocks that are intruded by Cretaceous plutons. The survey area has significant potential for stratiform Pb-Zn-Cu, stratabound Zn-Pb ± Cu-Ag-Ba polymetallic veins, tungsten, gold and gem beryl (emerald) in skarns and Li and REE in pegmatites.

Ground gamma ray spectrometric, total radioactivity and magnetic susceptibility measurements were collected at 149 sites by K. Ford during a six-day visit to the NTGO field camp located at Godlin Lakes. Pure limestones and dolostones have low potassium, uranium and thorium concentrations whereas shales and siltstones have substantially higher values and exhibit the greatest range of radioactive element concentrations. Sandstone and conglomerate lithologies also have low concentrations. Some black shale units have equivalent uranium concentrations greater than 20 ppm. Most of these are clearly indicated on the ternary radioelement map. Measurements were made on four of the Cretaceous plutons in the survey area. Of these four plutons, the one closest to the MacTung deposit is characterized by higher eU/eTh ratio values than the other three plutons. Elsewhere studies have shown that such signatures can have exploration significance by indicating plutons that are associated with or occur in close proximity to skarn and granophile-element mineralization.

STRATIFORM, COARSE-GRAINED AND HYDROTHERMAL DOLOMITE IN FRANKLIN MOUNTAIN FORMATION, NORTHERN MACKENZIE MOUNTAINS

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This poster presents some observations and analytical data from samples obtained during stratigraphic studies that are part of the multidisciplinary "Regional Geoscience Studies and Petroleum Potential, Peel Plateau and Plain" project being carried out by the Northwest Territories Geoscience Office, Yukon Geological Survey, and Geological Survey of Canada. In the Peel Region study area, Franklin Mountain Formation (Cambrian to Ordovician) is generally a silty, laminated dolostone interpreted to be deposited in a shallow water platform setting. At several locations at the front of the Mackenzie Mountains, medium to coarse-grained, vuggy, light grey to white dolomite, occurs in stratiform units, within otherwise tight Franklin Mountain Formation. The occurrences described here lie about 130 to 250 m above the base of Franklin Mountain Formation, which unconformably overlies Proterozoic Katherine Group quartzite.

Dolomitization is not associated with an obvious fault, but does occur in the hanging wall of a regional back-thrust on the north flank of the Stony Anticline.

The stratiform zones are 15 to 40 m thick, and include decimetre- to metre-scale interbeds of coarse-grained, vuggy dolomite with intervening beds of medium-grained to fine-grained, laminated dolostone. Saddle dolomite lines vugs, followed by calcite.

Three lithologic samples were collected in the Arctic Red River area (NTS 106G), along a strike length of about 17 km. Porosity measurements on core plugs yielded 4.4 to 9.4%. Maximum permeability was 1.07 millidarcies. These vuggy intervals are apparently laterally extensive, and may form viable reservoirs in the subsurface. Future petrographic studies will focus on the genesis of dolomitization.

GEOLOGY MODEL OF THE DO27 PIPE

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The DO27 pipe, part of the Tli Kwi Cho complex, is located within the Lac de Gras kimberlite province, approximately 30 km southeast of the Diavik diamond mine. The main pipe infill comprises pyroclastic kimberlite (PK) that previous studies determined to represent one phase of kimberlite (Doyle and Scott Smith, 1998). This PK has been the focus of extensive drilling by Peregrine Diamonds Ltd. during 2005 and 2006. The results of detailed logging of the 2005 and 2006 drill holes are presented in the updated DO27 geology model.

The DO27 kimberlite pipe is one of the largest pipes in the Lac de Gras area, with a surface area of at least 8 hectares. The pipe is odd-shaped, with a shallower, complex lobe lying to the northeast of the main vent. Preliminary investigations suggest that the main vent comprises massive PK with few internal variations and only very subtle bedding. There are no obvious variations in the proportion of single olivine grains versus juvenile lapilli, or in the types of juvenile lapilli present. This lack of variation suggests that there may only be one phase of kimberlite represented in the PK of DO27. The most obvious variations within the PK are seen in the country rock xenoliths, which can be crudely summarized by granite xenoliths being most common towards the centre of the pipe, and shale xenoliths most common towards the pipe margins. The total dilution throughout the Main PK remains <5%, and therefore does not have significant implications on diamond grade. Preliminary investigations suggest that there may be a graded bed evident in granite xenoliths, with larger (> 5 cm) xenoliths becoming increasingly common to a certain depth (generally around 250 m depth). This could be compelling evidence that only phase of kimberlite is present in the upper 250 m of the DO27 pipe. Continuation of this graded bed below 250 m data is constrained by a lack of drill hole information below this depth.

The northeast lobe of DO27 is complex and contains many different types of kimberlite. Volumetrically the northeast lobe is dominated by PK, which has many similarities with the PK of the main vent, but also displays some subtle differences; although all PK is modeled as one main phase, it is possible that the northeast lobe PK could represent an earlier phase. The second most volumetrically significant kimberlite is granite-rich (>25%), contains common fresh, coarse olivine macrocrysts, and is interpreted to be magmatic; this kimberlite may be related to the magmatic sheets common north of the DO27 pipe (Doyle and Scott Smith, 1998). Beneath the PK in the northeast lobe, the kimberlite geology is complex and includes a high proportion of large (> 10 cm) granite xenoliths as well as pulverized, fine-grained granite fragments; these units are interpreted to represent the early deposits related to the pipe excavation.

MACKENZIE VALLEY PROJECT GEOART INITIATIVE: LANDSCAPES OF THE NORTHWEST TERRITORIES

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The Geological Survey of Canada (GSC) is currently compiling regional-scale information on bedrock geology, surficial deposits and landform processes for the Northern Energy Development (NED) Mackenzie Valley Project. As an outreach initiative of this project, twelve paintings (in oil and acrylic), highlighting conceptual and geological landscapes of the south-central Mackenzie River watershed, have been produced by the author. Paintings and accompanying "geoart" cards link observations of shape, texture and colour with interpretations of process over a range of spatial and temporal scales in an attempt to explain the landscape. These works aim to contribute to the regional geoscience knowledge base in a manner that is more accessible to non-scientists; increasing public awareness and appreciation of Canadian natural resources and environmental issues. The original paintings are currently on display at GSC-Calgary.

MACKENZIE VALLEY PROJECT: LANDSLIDES OF THE SOUTH-CENTRAL MACKENZIE RIVER WATERSHED, NORTHWEST TERRITORIES

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Secure and reliable access to geoscience information is essential for effective land management decisions regarding pipeline, highway and community construction, extraction of aggregate and groundwater, and assessment of ecological sensitivity in the Mackenzie River watershed. As part of the Northern Energy Development Mackenzie Valley Project, the Geological Survey of

Canada is currently working to improve our understanding of the regional geology, glacial history and geomorphologic processes. Most landslides in the region are related to the degradation of permafrost or ground ice and groundwater flow through sediments; or rotational and translational failure of weak, deformed bedrock. Mass-wasting events are triggered by glacial "de-buttressing" of slopes, stream incision, tectonic activity, taiga fires, land-use practices and climate change. With regard to development within the Mackenzie Valley transportation corridor (e.g., construction of pipelines, highways and urban infrastructure), terrain units vulnerable to slope instability include areas with ice-rich, fine-grained sediments on slopes near water bodies; coarse-grained outwash overlain by clay-rich till and/or glacial lake deposits exposed in steep river cut banks where permafrost does not extend to section bases; and areas affected by fire.

Results of our work will be published as CD-ROM Open Files with an interactive landslide database and terrain maps.

SOUTH WOPMAY BEDROCK MAPPING PROJECT AND INTEGRATED STUDIES: 2006 UPDATE

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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 summer of 2006 marked the third and final full season of mapping for the project and results are summarized below. Results from auxiliary studies related to the project are reported in this volume (see Azar et al., Bennett et al., Byron et al., Corriveau and Mumin, Sandeman et al., Steeves et al., and Sutherland et al.).

The north-trending Wopmay fault zone bisects Wopmay orogen, allowing subdivision of the project area into eastern and western domains. The eastern domain consists of mixed Archean and Proterozoic plutonic and supracrustal rocks. South of Rebesca Lake, injection gneiss consists of granodiorite-tonalite, amphibolite (much of which represents dismembered mafic dykes), and younger granite. All phases of the gneiss are crossed by the (Proterozoic?) Black Lichen Lake granite, indicating the protolith to the gneiss may be Archean. The absolute age(s) of the Proterozoic supracrustal rocks are poorly constrained. Adjacent to the Archean Slave craton, clastic- and carbonate-dominated sedimentary rocks, which have undergone low-grade metamorphism, are assigned to the previously defined Paleoproterozoic Snare Group. The clastic succession rests unconformably on Archean basement rocks; the carbonate package appears to be everywhere in fault-contact with this basement. Further west, abundant semi-pelitic schist, quartzite, and mafic to intermediate units (interpreted to have a volcanic protolith) are metamorphosed to amphibolite grades. It is currently not known whether these rocks are part of

the Snare Group. Laterally extensive gossanous zones, similar to those documented at Ingray Lake, are found within the pelitic and psammitic schists at Castor Lake.

The western domain is dominated by felsic to mafic and quartz-rich to quartz-poor Proterozoic plutonic phases, which compose the Great Bear magmatic zone. Felsic and intermediate porphyries, which are mainly interpreted as hypabyssal intrusions, are locally associated with volumetrically minor amounts of lapilli and ash tuff (e.g. at De Vries and "Fab" lakes). Two relative ages of porphyry are recognized; an older, foliated pre-granite emplacement porphyry and a younger, isotropic post-granite intrusion porphyry. Remnants of semi-pelitic schist, which have been tentatively correlated with the Paleoproterozoic Treasure Lake Group, are preserved near Margaret Lake. Intense alteration zones that mark potential iron-oxide Cu-Au-U mineralizing systems are concentrated at De Vries and Fab lakes. Field relationships indicate that there may be two stages of alteration (pre- and post- granite emplacement and volcanic deposition) and therefore two mineralizing events.

In 2006, geochemical and isotopic sampling of the major magmatic phases was carried out along an east-west transect in the northern part of the project area. This data will be combined with previously conducted sampling transects, as well as geophysical transects, to further characterize/define the evolution of the south Wopmay orogen.

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 (DIAND), 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 in support of responsible development of mineral and energy resources, geoscience education, training opportunities, and to assist with GIS requirements of Nunavut-based partners. In 2006, the CNGO participated in multi-component field-based projects, is a principal partner in development and implementation of a web-based system of data delivery (Nunavutgeoscience.ca), and provided GIS, cartographic, Remote Predictive Mapping (RPM) support, and outreach activities.

The Southwest Baffin Integrated Geoscience Project (SWBIG) included regional-scale bedrock and surficial mapping in the Foxe Peninsula area, SW Baffin Island. These activities, co-managed by the GSC and the CNGO, are intended to enhance mineral exploration and development opportunities in the region by improving the level of geoscience information and reducing exploration risk. The area is underlain by Paleoproterozoic (and Archean?) supracrustal

and intrusive rocks having significant exploration potential for base-metal mineralization. Targeted SWBIG field activities follow acquisition of a new, detailed aeromagnetic survey of the eastern part of the Foxe Peninsula in 2006.

The Borden Basin project, northern Baffin Island, was designed to develop a better understanding of the structural and stratigraphic controls on carbonate-hosted base-metal mineralization in the Mesoproterozoic Borden Basin. Field assessment of known and newly discovered zinc occurrences and detailed examination of stratigraphic sections have provided new insight into a) the regional lithofacies variations in the host unit, and b) the distribution and significance of structures inferred to focus mineralizing fluids.

In addition to field activities, CNGO staff are evaluating the hydrocarbon potential of Ordovician – Silurian rocks of the Hudson Bay region. The study utilizes new conodont CAI data and Rock-Eval Pyrolysis as tools to demonstrate thermal maturation.

Finally, the CNGO is resolute in providing service to clients. To meet client demands for searching, viewing and accessing integrated spatial data (e.g., assessment files, mineral occurrences, and geoscience data), and to place Nunavut in a competitive position serving a global, mineral exploration industry, the CNGO and DIAND developed and implemented a Web Delivery project in 2006. Nunavutgeoscience.ca is intended to be the 'single-door', web-entry point for clients looking for components of spatial, geoscience data. This is a multi-partnered, collaborative project involving geologists, compilers, data managers, and IT specialists from the CNGO, DIAND (Iqaluit), GSC, NTGO, and NTI.

POSTER WITHDRAWN

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Withdrawn

ESTABLISHING A COMPREHENSIVE GEOLOGICAL FRAMEWORK FOR THE NATURE OF THE UNDERLYING BASEMENT BENEATH THE MACKENZIE MOUNTAINS, NORTHWEST TERRITORIES

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The basement beneath a large portion of the northern Cordillera in northeastern BC, eastern Yukon and the southwestern Northwest Territories is referred to as the Nahanni domain. The age and composition of this basement is poorly known, as exposure of this terrane in the region does not exist. Therefore the aim of this study is to provide valuable insight into the tectonic, geochemical, and geochronological framework of the underlying basement of the western Mackenzie Mountains. Initial fieldwork for the study was carried out in July and August 2006 in collaboration with the Sekwi Mountain Project funded by the Northwest Territories Geoscience Office.

The project comprises three separate research thrusts. First, representative samples were collected from seven mid-Cretaceous plutons in the study area that are thought to be crustally derived on the basis of mineralogy and geochemistry. Crystallization ages for the intrusions will be determined using in situ U-Pb zircon dating methods. The ages of inherited zircon cores will also be dated and hafnium isotopic compositions of both cores and igneous rims will be determined also using in situ methods. The age and hafnium isotopic composition of the inherited cores will provide critical information about the nature of the crustal material that was melted to produce the magmas (possibly including components of the underlying basement). Secondly, a comprehensive U-Pb detrital zircon study of 15 different clastic sedimentary formations, stratigraphically sampled throughout the Sekwi Mountain Project map area, will be

used to constrain the age and provenance of the individual sedimentary units. These units may include components from crystalline basement in the region melted to form the intrusions. A small number of xenoliths, which are thought to be derived from underlying crystalline basement, were identified in a ~450 Million year old ultramafic lamprophyre pipe termed the Mountain Diatreme. These will be dated and examined petrographically and geochemically to provide direct evidence of the nature of the Nahanni domain through which the diatreme intruded. These data for basement xenoliths will form part of a much more extensive dataset we hope to obtain over the next two years. Collectively all three studies will serve as a definitive and comprehensive geological framework for the study of the underlying basement of the Mackenzie Mountains and more broadly the Northern Cordilleran.

Initial U-Pb results and preliminary interpretations from the detrital zircon study as well as preliminary petrographic characteristics of the Cretaceous plutons will be reported.

NEW HYPOTHESES RESULTING FROM RECONNAISSANCE DRIFT AND STREAM SEDIMENT SAMPLING SURVEYS IN THE VICINITY OF THE HORN PLATEAU, NWT

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The Geological Survey of Canada (GSC), in collaboration with the Northwest Territories Geoscience Office (NTGO), is examining the surficial geology of the Mackenzie River watershed to improve our understanding of the limits to glaciation, subglacial processes, ice flow and meltwater drainage patterns, glacial lake history, landslide hazards and mineral resources. Building on initial work by the NTGO, the Northern Resources Development Program (NRD) and the Northern Energy Development (NED) Mackenzie Valley Project is developing new and innovative ways to interpret specific mineral assessment findings in western half of the Horn Plateau - part of the Edehzhie Protected Area Strategy proposed protected area. This presentation summarizes the current and previous research undertaken in the region, and tests two competing hypotheses: 1) kimberlite indicator minerals (KIMs) are sourced from primary deposits up-ice from the study area — in this case, the source may be kimberlites of the Slave craton, ca. 500 km to the northeast. 2) Tens of millions of years passed after emplacement of the last of the "Slave" kimberlites before glaciers covered the landscape, so there is potential for secondary fluvial sources of KIMs (and possibly diamonds). If glaciers eroded fluvial "placer-type" sediments, then secondary KIM signatures may have been reworked into tills and other glacial deposits. In this scenario, KIM anomalies do not necessarily reflect a simple track back to the source kimberlite pipe(s). The interpretation of geochemistry data collected during the 2005 and 2006 field seasons takes into account the mineral potential of underlying bedrock, regional (and local) ice flow patterns and depositional history of sediments sampled. Our work aims to provide

government agencies, industry and the public access to geoscience information essential for effective land management decisions regarding pipeline, highway and settlement construction, extraction of aggregate, mineral resources, and assessment of ecological sensitivity in the region. To know whether KIM anomalies observed in till and modern stream sediments are secondary (i.e., derived from the source kimberlite) or tertiary; that is derived from a fluvial "paleo-placer" deposit is critical to successful and cost-effective exploration. Further testing of these alternative hypotheses could have significant impacts on land-use and development decisions for this region; help to attract new investment, and reduce exploration risk in this extensively drift-covered and vegetated terrain.

WERE GIANT ROTATIONAL SLIDES ACTIVE DURING DEPOSITION OF THE NEOPROTEROZOIC MACKENZIE MOUNTAINS SUPERGROUP?

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Isopach maps of the mudstone-dominated Tsezotene Formation indicate that the Mackenzie Mountains Supergroup was deposited along the arcuate margin of an extensional basin that deepened to the WSW. Plots of the net thickness of overlying sandstones, mudstones and carbonates of the Katherine Group show similar trends, although accurate mapping is compromised by a paucity of data. When the thicknesses of individual sandstone-dominated formation-scale units within the Katherine Group are plotted, it becomes apparent that isopachs do not follow regular, craton-parallel trends. Instead, major inboard thickening is present between 64º and 65º30'N in units K1 and K3, and to a lesser extent in units K5 and K7. The along-strike thickness differences suggest that fluvial facies prograded into a basin that was characterized by large-scale rotational block-slides caused by basin extension. This involved collapse of the margin in segments up to 150 km along strike and 50-70 km normal to the margin. The northern margin of the most prominent sub-basin may have been marked by a transverse fault immediately S and SW of Norman Wells. This could have influenced thickness trends in overlying strata of the Little Dal Group and may have acted as a conduit for ore-forming fluids. Refining these thickness maps by acquiring more data in critical areas may lead to the discovery of other deep-seated fault systems which could be important to regional fluid flow and mineralisation patterns.

UNLEASHING OLIVINE'S POTENTIAL AS A FIRST CLASS KIMBERLITE INDICATOR MINERAL THROUGH FTIR SPECTROSCOPY

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Until now characteristics used to identify kimberlitic olivines in till samples were exclusively based on chemical composition (Mg#, Ni content). This approach is, however, highly unreliable. A large proportion of kimberlitic olivines is derived from disintegrated peridotite and based on olivine chemistry it is not possible to distinguish such kimberlitic xenocrysts from peridotitic olivine of non-kimberlitic affinity. Moreover, there is significant compositional overlap between basaltic and kimberlitic olivines. FTIR spectroscopy eliminates such ambiguity and allows reliably isolating kimberlitic olivine. The FTIR spectrum yields the concentration of hydrogen dissolved in olivine, which for reasons of convenience is commonly expressed as amount of dissolved "water". Anomalously high water concentrations in kimberlitic olivine (>50 ppm) result from interaction with or crystallization from a hydrous melt (e.g. kimberlitic) at great depth. Preservation of this characteristic feature is only possible due to the extremely fast ascent of kimberlitic magmas. This unique combination of hydrous conditions at depth and extremely rapid exhumation render anomalously high water contents an exclusive feature of kimberlitic olivines.

In order to develop the water content of olivine into an exploration method we have studied olivines from kimberlites at Lac de Gras, Fort a la Corne, and Attawapiskat. We have determined major FTIR spectral types and water contents characteristic of Canadian kimberlites. Over 80% of the studied kimberlitic olivines contained >100 ppm of structural water. For comparison, the highest concentration reported so far for olivines of non-kimberlitic affinity is <30 ppm. The developed technique is non-destructive and even allows analysis of "rough" (unpolished) grains. An entire analysis, including mounting the sample, takes about 3 minutes. Data processing may be fully automated using macros. Considering the robust and relatively inexpensive nature of FTIR equipment the cost of single analysis in future commercial applications will be low (i.e. significantly lower than that of electron probe microanalysis). The technique was tested on "blind" samples provided by several exploration companies. The tests confirmed the efficiency of the method and allowed to set up basic criteria for the quality of olivine grains. Best FTIR results were achieved for unaltered olivine grains free of aqueous fluid inclusions from the 0.5-1 mm size fraction.

The uniqueness of the FTIR signature of kimberlitic olivine puts it in line with chemical analysis of pyrope garnets. Considering how abundant olivine is in till samples collected at conditions of the Canadian arctic, this new method should significantly enhance our ability to recognize kimberlitic indicator mineral trails.

REGIONAL METALLOGENY OF THE MACKENZIE MOUNTAINS, NWT

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The Mackenzie Mountains are an arcuate mountain belt that is part of the North American Cordillera, the western-most structural province in the Northwest Territories. Proterozoic strata were deposited along a rifting margin followed by extensive Palaeozoic deposition on a stable margin. This margin transitioned from an eastern carbonate platform to a more westerly argilliceous basin. Sedimentary rocks were intruded by minor Devonian (350 Ma) granitoid rocks, and then deformed by folding and thrusting during Jurassic (~170 Ma) to Cretaceous collision of an island arc with western North America. Crustal melting during the Cretaceous collisional event contributed to the emplacement of voluminous granitoid batholiths in the westernmost Mackenzie Mountains. Compressive and right-lateral strike slip adjustments continued through the Tertiary (~40 Ma) to the present.

This complex geologic history was responsible for the formation a variety of mineral showings. In spite of the challenging topography, difficult logistics, and nearly absent infrastructure, a single generation of exploration has identified over 300 showings in the region. The mineral showings vary in size and importance, from numerous isolated mineralized areas through to world-class minable deposits. The showings have a variety of complex characteristics, but they can be classified into a series of 'types' including: banded iron formation (BIF), redbed-associated copper, zinc-lead-silver (Sedex type; Skarn type; Irish type), skarns with a variety of commodities, most significantly tungsten, gold (Placer and Lode type), emeralds and other gemstones, lithium and rare elements (in pegmatites). Metallogenic regions can be defined based on the distribution of these showing types.

SHRIMP U-PB DETRITAL ZIRCON EVIDENCE FOR TWO TEMPORALLY DISTINCT TURBIDITE SUCCESSIONS IN THE WESTERN SLAVE CRATON: REGIONAL CORRELATIONS AND INDICATIONS FOR A CA. 2630 – 2610 MA CONTINENTAL BACK-ARC BASIN

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The Neoarchean supracrustal stratigraphy of the Slave Province is composed of more than 70% greywacke-mudstone turbidites, making it somewhat unique among Archean cratons. Previous field studies and U-Pb zircon dating have shown that the Burwash Formation turbidites and correlatives were deposited at ca. 2660 Ma across much of the Slave craton. However, a younger

(<2629 Ma) locally iron-formation-bearing turbidite package, the informally named Damoti Lake sequence, has been identified in the western part of the craton.

To better understand the distribution and maximum deposition age of this younger turbidite sequence, sensitive high-resolution ion microprobe (SHRIMP) U-Pb detrital zircon analyses were undertaken on five strategically selected greywacke samples in the western Slave craton (west of ~110º longitude). The samples are from the Mosher Lake and Russell Lake turbidites in the southwest, the Emile River turbidites in the west, and the Itchen and Contwoyto formations in the west-central part of the craton. The number of zircons analyzed in each sample ranged from 44 to 62. Maximum deposition ages were estimated from replicate analyses of the youngest zircon determined in each sample (weighted mean ages ± 2 standard error of the mean).

In the southwest, the Mosher Lake greywacke yields a maximum deposition age of 2651±5 Ma. The greywacke sample from the iron-formation-bearing Russell Lake turbidites yields a maximum depositional age of 2625±6 Ma. To the west, the greywacke from the iron-formation-bearing Emile River turbidites has three grains with weighted mean ages of 2637±10, 2639±13, and 2642±13 Ma indicating a maximum deposition age of ca. 2640 Ma. In the west-central part of the craton, the iron-formation-bearing Contwoyto Formation has four grains with weighted mean ages around 2640 Ma, but also a younger grain with an age of 2619±14 Ma. The two youngest grains in the Itchen Formation greywacke/arenite are 2653±10 Ma and 2658±8 Ma, indicating a maximum deposition age of ca. 2660 Ma.

The SHRIMP U-Pb zircon results confirm that at least two distinct turbidite sequences occur in the western part of the craton. We suggest the turbidites with maximum deposition ages older than ca. 2650 Ma (i.e., the Mosher Lake and Itchen Formation turbidites) are Burwash equivalent. The Burwash Formation has been proposed to have deposited in a rifting-arc environment at ca. 2660 Ma. The younger, iron-formation-bearing Russell Lake, Emile River, and Contwoyto Formation turbidites are likely equivalent to the <2630 Ma Damoti Lake sequence. Any tectonic model proposed for the Damoti sequence must meet the following observations: 1) deposition on previously formed and deformed continental crust; 2) conditions allowed the chemical precipitation of iron-formation along with some carbonate within the turbidite-dominated basin; 3) the SHRIMP results indicate that there is nothing exotic in the zircon populations and the sedimentary source did not significantly change from the time of Burwash Formation deposition; 4) deposition occurred proximal to the ca. 2630 Ma Defeat magmatic arc, and; 5) the turbidites were folded by ca. 2610 Ma when they were intruded by Concession Suite magmatic arc. To meet these observations, we suggest the Damoti equivalent turbidites were deposited in a continental back-arc basin.

DEVONIAN CARBONATES OF THE SEKWI MOUNTAIN MAPPING PROJECT: A STATUS REPORT AND EXPECTED RESEARCH IN THE NEXT TWO YEARS

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The Early to Middle Devonian platform carbonates of the Mackenzie Mountains are similar to correlative carbonates deposited elsewhere in the western North American Cordillera which have produced abundant oil and gas reservoirs in Alberta. One of the goals of the Sekwi Mountain mapping project is to determine the reservoir potential of the Early and Middle Devonian carbonates that may be located beneath the Plateau Thrust. During the summer of 2006 Mike Pope helped the Sekwi Mountain mapping team study Early and Middle Devonian carbonates within the Sekwi Mountain (105P) map area. In this area there is a well-developed carbonate platform to basin transition where these carbonates thin from more than 1 km thick in eastern exposures to less than 100 m in westernmost exposures. The carbonates are well-exposed above treeline and along stream valleys. Most of the Devonian carbonates are dolomitized, similar to exposures in the Rocky Mountains, and thus they may have excellent reservoir potential. The carbonates interfinger with organic-rich shales (Road River Group) that are a probable source rock in the area and beneath the Plateau Thrust.

We are currently searching for a Ph.D. student to spend the next two summers mapping and studying the Devonian carbonates with the Sekwi Mountain Mapping Team. The project will entail detailed mapping in areas on both sides of the Plateau Thrust. This research will aid in establishing the detailed sequence stratigraphic and diagenetic framework for these units in these areas and should fill a critical gap in knowledge between the better known exposures to the east (near Norman Wells) and south. To provide important time constraints on this succession we expect the Ph.D. candidate to establish a conodont biostratigraphic framework for the Early and Middle Devonian rocks in these areas. If time permits we also plan to integrate a detailed chemostratigraphic project within the sequence and biostratigraphic framework.

MID-CRETACEOUS GRANITOIDS IN THE SOUTHWESTERN NORTHWEST TERRITORIES AND SOUTHEASTERN YUKON: IMPLICATIONS FOR MAGMA SOURCE REGIONS, TECTONIC SETTING, AND METALLOGENY

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A comprehensive study of mid-Cretaceous intrusions in the Mackenzie and Selwyn mountains of southwestern Northwest Territories and southeastern Yukon was undertaken to assess the regional metallogenic potential and to better define the source and tectonic setting of the magmatism. The study area comprises the easternmost extent of the Tintina Gold Province (TGP), an elongate band of Cretaceous intrusions characterized by metalliferous and non-metalliferous plutonic suites.

Four plutonic suites of the TGP have been identified within the study area: Tombstone (90-94 Ma), Tungsten (95-99 Ma), Tay River (96-100 Ma), and Hyland (100-106 Ma). Tombstone suite intrusions are oxidized/reduced, alkaline/subalkaline, meta- to peraluminous (ASI ~ 0.8-1.15), medium-coarse grained, hornblende-biotite-(pyroxene) quartz monzonite, quartz monzodiorite, and granodiorites associated with disseminated Au-Bi-Te, Sb-skarn, Pb(Ag)-Zn-As-Cu vein occurrences. Tungsten suite intrusions are very small to small, fine-medium grained, weakly K-feldspar porphyritic (<0.5 cm), reduced, subalkaline, weakly peraluminous (ASI ~ 1.0-1.15), biotite +/- muscovite-(garnet/tourmaline) monzogranites associated with W-(Cu-Au) skarn occurrences. Tungsten suite intrusions may be distinguished geochemically from all other suites by *Th/U >>1, resulting from a high degree of fractionation and the crystallization of monazite, and background plutonic tungsten concentrations are depleted (<50 ppm) relative to Tombstone and Tay River suite intrusions. A sub-suite, Tay River-Tungsten (96-100 Ma), shares features of both Tungsten and Tay River suites and is associated with Cu-skarn, and distal Pb(Ag)-Zn vein occurrences. Tay River suite intrusions are typically very large, oxidized/reduced, sub-alkaline, weakly peraluminous (ASI ~ 1.0-1.1), medium-coarse grained K-feldspar porphyritic (>1 cm), biotite-hornblende granodiorites associated with Pb-Zn replacement-style occurrences. Tungsten suite intrusions are inferred to represent highly fractionated melts derived from coeval Tay River suite intrusions. Hyland suite intrusions are similar to Tay River suite intrusions but are more peraluminous (ASI ~ 1.0-1.2), biotite monzogranite and granodiorites typically associated with W-skarn occurrences.

Trace element discrimination diagrams are inconclusive with respect to magma type (S- or I-type), and the rare earth element primitive mantle normalized profiles of all the intrusive suites are depleted in high field strength elements (Nb-Ta-P-Ti). Furthermore, on the epsilon Nd vs. initial Sr ratio plot intrusions from all four plutonic suites plot as a trend from lithospheric mantle isotopic compositions towards upper crustal isotopic compositions, indicating that they are not wholly derived from partial melting of middle to upper crust. Several plug-like intrusions of the Hyland, Tay River, and Tombstone suites and coeval unaltered mafic dykes have anomalously low *Rb concentrations, signifying a role for a Rb-depleted source region such as crustal

material that has undergone a prior partial melting event. There are several possible magma sources consistent with the above: (1) multiple partial melting events of immature arc-derived sediments, (2) high temperature partial melting of mafic lower crust (hornblende-bearing), and/or (3) influx of a mantle melt/fluid component. It is likely that a combination of these factors have operated to varying degrees, resulting in the geochemical and isotopic signatures expressed by all four plutonic suites and the broad trend towards more primitive magmas with younger plutonic suites.

*normalized to the primitive mantle (Sun and McDonough, 1989)

PRELIMINARY RESULTS OF MINERAL POTENTIAL ASSESSMENT OF ACASTA GNEISSES, NWT

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The Acasta Gneisses, exposed along the western flank of the Slave craton, contain the oldest known intact fragment of continental crust on earth and thus represent a unique and finite scientific resource. Attention was first drawn to the gneisses in 1989 when Bowring et al. (1989) published their paper on the ca. 3.96 Ga age of zircons from the site; since then, numerous research teams have visited and sampled the rocks. The area has also seen considerable interest by the general public, and a modest business has been created selling pieces of Acasta Gneiss for souvenirs.

In 2003, members of the NWT Protected Areas Strategy (PAS) Secretariat met with geologists working in the NWT to discuss the possibility of designating the site a protected area. While discussions have been preliminary to date, the general intent of the designation would be to manage and coordinate sampling and research at the site, and to share information aimed at the general public on this unique area. Economic activities, such as sampling and sale of lapidary products, are compatible with this vision.

This summer, the NWT Geoscience Office initiated a non-renewable resource assessment of the Acasta Gneisses, as required by the PAS process. The first phase of the assessment, still in draft form, consisted of an evaluation of mineral potential based on publicly-available geological and mineral occurrence data. The following deposit types were considered: volcanogenic massive sulphides, vein-hosted lode gold, iron formation-hosted gold, magmatic Ni-Cu-PGE, and kimberlite-hosted diamonds. Based on favourable geologic environments but a relative paucity of data, diamond and magmatic sulphide potential were ranked as moderate and moderate-to-low, respectively, with low certainty. A recommendation for further study was made in the report. Potential for the other deposit types was ranked low to very low, with moderate to high confidence, and no further work was recommended.

Follow-up field work was carried out as part of the University of Alberta's NWT Field School; students documented rock types in the area and collected a number of till and assay samples to assess the potential for kimberlites and the presence of sulphides in mafic gneisses. Samples were also collected to support a thesis study on the petrogenesis of metagabbro; this study will help to further assess magmatic sulphide potential. Preliminary results of the field studies will be presented.

Reference:
Bowring, et al. 1989. Geology, 17

LANDSLIDE SUSCEPTIBILITY MAPPING IN THE MACKENZIE VALLEY, NORTHWEST TERRITORIES: PRELIMINARY RESULTS FROM A QUALITATIVE PARAMETRIC METHOD.

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This poster briefly summarizes the approach undertaken to determine areas more susceptible to landsliding in the Mackenzie Valley. This landslide susceptibility mapping approach can be useful in defining more appropriately and safely locations for futures infrastructures and communities.

Landslide susceptibility mapping methods can be quantitative or qualitative. Whereas quantitative methods are data driven where a representative sample is required, as well as a good spatial distribution, qualitative methods, however, are based on the judgment of experts (*e.g.* opinions from scientists familiar with the terrain). In the present pilot project, a qualitative parametric method was selected because of its: i) flexibility to incorporate data sets from different sources, ii) possibility to evaluate the different data sets as individual parameters, iii) suppleness to combine spatially the data sets, and iv) the familiarity of GSC scientists with the terrain. The qualitative parametric method used here was first applied to a pilot study area in the Travaillant Lake and Thunder River regions and then applied to a larger study area in the Mackenzie Valley. This Mackenzie Valley Study Area (MVSA) encompasses a corridor extending 20 km to either side of the Inuvik-Tulita section of the proposed gas pipeline route, for a length of 540 km and an area of about 24,000 km^2. MVSA also includes the Rampart (southwest of Fort Good Hope) and the Thunder River regions, both known for widespread landsliding

This parametric method is divided into five steps: 1) Selection of data sets, including most important physical parameters that contribute to mass movements; 2) Creation of new layers and data conversion (e.g. vector to raster); 3) Layer reclassification, i.e. each physical parameter units are given a landslide susceptibility class (e.g. very low, low, moderate, high, or very high) based on the judgment of GSC scientists familiar with the terrain and also derived from the available knowledge on the influence of the physical parameters on landslide occurrence; 4) Layer

ranking: ranks (1 to 10) were assigned to the reclassified units for mathematical computations at the pixel level; and 5) Layer weighting and integration into an equation resulting into Susceptibility Index (SI). Weights expressed as percentages were assigned to the six layers based on their relative importance in influencing terrain susceptibility to landsliding. The resulting susceptibility indices, values ranging from 1 to 10, were classified in three landslide susceptibility zones (low, moderate, and high), by grouping SI values 1 to 3 as low, 4 and 5 as moderate, and SI values from 6 to 10 as high to create the landslide susceptibility map. Results from the susceptibility mapping are validated by a comparison with the Mackenzie Valley Landslide Spatial Database. The approach taken is proven to provide good correlation between observed landslide locations and landslide susceptibility zones.

A NEW LOOK AT THE ECONOMIC PROSPECTIVITY OF SW BAFFIN ISLAND

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The 2006 South West Baffin Integrated Geosciences project (SWBIG) is a partnership between the Canada-Nunavut Geoscience Office, the Geological Survey of Canada (Northern Resources and Development Program) and the Qikiqtani Inuit Association designed to update geoscience knowledge through bedrock and surficial mapping, rock sampling for geochronology and geochemistry, till sampling and resource assessment activities supported by new regional aeromagnetic coverage. An early outcome of the SWBIG initiative is the recognition of new occurrences of rock units prospective for base- and precious-metal mineralization, and a better understanding of the extent of units prospective for carving stone and gemstone commodities.

Rock units prospective for base- and precious metal mineralization include a package of mafic-ultramafic ± intermediate volcanic rocks (informally referred to as the Schooner Harbour belt) which extends some 100 km from Schooner Harbour on the southwest coast of Baffin Island to the West Foxe Islands off the south-central coast. Also prospective are a suite of mafic to ultramafic sills intrusive into the principal Paleoproterozoic metasedimentary cover sequence, the <1.93 Ga Lake Harbour Group. Conspicuous, rusty-weathering, sulphide-bearing rocks associated with these two suites were sampled and assayed to assess base metal (e.g., copper, nickel, zinc) and precious metal (e.g., gold, silver, platinum) potential across the southwestern Baffin region.

The discovery in 2002 of sapphire mineralization associated with metasomatized marble and granitic pegmatite to the east of the SWBIG map area (in the Kimmirut – Crooks Inlet area) highlights the potential for this type of mineralization across southwestern Baffin Island. Within the project area, marble and associated calc-silicate units of the Lake Harbour Group are extensively exposed across broad synformal basins. Of particular interest with respect to

gemstone potential are numerous localities at which the metacarbonate sequences are in contact with intrusive felsic rocks, the contact zone being marked by minerals such as pale pink-violet titaniferous diopside and blue-green spinel, minerals considered as pathfinders at known sapphire occurences.

New sources of carving stone for the $3.0M/annum industry based in Cape Dorset are required before the total depletion of known quarries. During the summer's work, two distinct settings for carving stone were identified. The first is deformed and hydrated ultramafic rock (generally occurring as peridotite sills but also as ultramafic flows) yielding dark green to black carving stone. The second is skarn rock (forsterized marble) formed at the intrusive contact between (possibly Cumberland Batholith) granite and Lake Harbour Group marble, which yields the much-prized yellow-green carving stone. Possible new sources of both types of carving stone were identified in the coastal regions of the project area, thus further highlighting the potential for a rich diversity of mineral deposit types in southwestern Baffin Island.

PROTEROZOIC MAFIC SILLS NEAR CASTOR LAKE (NTS 86C), WOPMAY OROGEN, NORTHWEST TERRITORIES

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Under the auspices of the Southern Wopmay Mapping Project, detailed mapping and lithogeochemical sample collection was undertaken on two distinct mafic intrusions near Castor Lake. A representative suite of sills with similar field and petrological relationships were sampled throughout the area to provide a regional perspective. A broad (ca. 2 km wide) northeast- to north-trending Hottah mafic sill (ca. 780 Ma) cross-cuts all rocks in the study area. Although contacts are typically confined to topographic lows, the sill appears to generally follow the dominant foliation as well as the form surfaces of regional-scale open folds in the country rocks. Near the intrusion contacts the sill is characterized by grey-weathering aphanitic chill zones (ca.50 cm) containing fine-grained sieve-textured plagioclase and clinopyroxene glomerocrysts with rare tiny opaque grains. The majority of the sill is characterized by brown weathering, locally columnar jointed, medium-grained (5mm) equigranular diabase with bladed subhedral plagioclase, anhedral clinopyroxene and subhedral magnetite. Olivine has not been identified in any specimen.

A second variety of mafic sill found in the area is exemplified by the sill forming the approx. 50 m, thick backbone of a sereies of ENE trending islands in Castor Lake. The sill is interlayered with a package of NW-dipping, fine-grained muscovite-biotite arenites and pelitic schists. The sill pinches and swells and locally cross-cuts the stratigraphy. It is medium-grained ($\leq$4mm) along the lower contact and in the interior comprises coarse-grained ($\leq$8 mm), hornblende porphyroblastic amphibolite. Hornblende porphyroblasts are sinuous, are partly replaced by secondary amphibole and likely indicate that early metamorphic growth was outlasted by deformation. This set of sills appear to belong to the stratigraphy of the Paleoproterozoic "Snare

Group" but their absolute age is unknown. Based on cross-cutting relationships and textural parameters, it may be correlative with the Morel sills (Lalonde, 1998) exposed farther north in the Coronation Supergroup of Wopmay orogen.

Preliminary lithogeochemistry indicates that both sills have tholeiitic basalt compositions. The Hottah sill exhibits lower Mg#'s (20.8-36.2 vs 45.0-53.0), Al_2O_3 (11.0-13.8 vs 13.8-15.2 wt. %), CaO (7.1-9.0 vs 8.1-10.7 wt. %), Cr (7-71 vs 97-129 ppm), Ni (8-72 vs 57-112 ppm and Sc (33-44 vs 40-48 ppm) than the Morel sill, but has higher abundances of all other major and incompatible trace elements. Rare earth and multi-element plots indicate that the Hottah sill is LREE-enriched ($[La/Yb]_{CN}$=2.48-2.75), has minor negative Eu anomalies (Eu/Eu* = 0.87-1.03) and exhibits troughs for Ba, Sr, Nb, P, and Ti. In contrast, the Morel sill is weakly LREE-enriched ($[La/Yb]_{CN}$=1.19-1.45), has variably developed positive Eu anomalies (Eu/Eu* = 1.08-1.22) and lacks high field strength elements troughs. These observations indicate that the Hottah sill represents an "arc-like" continental tholeiitic suite generated via melting of sub-continental lithospheric mantle, whereas the Morel sill appears to have been derived from depleted, asthenospheric mantle. Further mineral and whole-rock geochemistry as well as radiogenic isotopic analyses may help to clarify the petrogenetic evolution of these suites.

RADILI KOE (FORT GOOD HOPE): COMMUNITY MAPPING PROGRAM

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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 program is to foster an interest in geology at the community level as well as familiarize people with the nature of work done when bedrock mapping. The end product is a poster that focuses on the geology, landforms, historic sites and other areas of interest described by the community. The poster design is unique – by the community, for the community, about the community – in an effort to encourage a general interest in geology as well as providing an educational tool for teachers and a starting point for geo-tourism.

In 2006, the community mapping project was undertaken in Fort Good Hope, NWT, as a joint venture with this Sahtu community. Consultations with the Band office and community members were an integral part of the program. The Band hired three geological assistants and a guide to work on the project. A public information session was held in the community during the mapping project to share the information gathered, and people were encouraged to bring their questions forward and add their knowledge to the project. This session also provided an opportunity for people to ask questions on exploration/mining and mineral resource issues.

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

The Fort Good Hope community poster consists of a geologic map, descriptive notes and photographs assembled in consultation with community members. The poster will be distributed to the community and a presentation is to 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 NWT Geoscience Office website.

It is hoped that this hands-on experience will foster an interest in careers in science and technology. The increased knowledge of the geology, mineral resources and the exploration/mining business will also serve as background information in making land use decisions.

PRELIMINARY GEOCHEMISTRY AND GEOTHERMOBAROMETY OF MANTLE ECLOGITE XENOLITHS FROM THE JERICHO KIMBERLITE, NUNAVUT

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This poster represents the initial results of a M.Sc. project in the Department of Earth and Atmospheric Sciences at the University of Alberta. The goal of the project is to determine the age and possible protoliths of mantle eclogite xenoliths from the Jericho kimberlite, Nunavut, thereby shedding light on the nature of the Slave Subcontinental Lithospheric Mantle and its relationship to the overlying crust. The present study builds on the earlier research published by Kopylova et al. (1998, 1999 and 2004) and Heaman et al. (2006). We report here preliminary mineral composition and thermometry data for 14 mantle eclogite xenoliths recovered from the Jericho kimberlite. Most of the eclogite samples in this study exhibit layered fabric consisting of anhedral garnet and clinopyroxene or are massive, bi-mineralic garnet-clinopyroxene rocks, (groups II and I of MacGregor and Carter, 1970). Accessory phases in some xenoliths include kyanite, corundum, rutile, apatite and olivine. Trace zircon inclusions in garnet have also been discovered in one xenolith. Some xenoliths have been invaded by kimberlite melts, and contain secondary mineral assemblages such as phlogopite + calcite + amphibole + devitrified melt in veins and fractures. Clinopyroxene is variably altered, ranging from alteration rims of fine pyroxene, chlorite, and serpentine to almost complete alteration to serpentine, fine-grained chlorite and calcite.

Major-element compositional data has been obtained from microprobe spot analyses on fresh garnet and clinopyroxene. The mantle eclogite xenoliths reveal variable and extreme geochemistry. The clinopyroxene Al_2O_3 content is quite variable, ranging between 2.1 to 14.6

wt.%. Clinopyroxene comprises up to 54% jadeite component (Na_2O< 7.9 wt %); samples that contain kyanite±corundum also have high Al_2O_3 and Na_2O. Garnet and clinopyroxene Mg-numbers range from 0.31 to 0.79, and 0.71 to 0.90, respectively. CaO contents in garnet are variable, ranging from 4 to 17 wt. %. Based on the proportions of pyrope, almandine and grossular component (X_{Mg}, X_{Fe} and X_{Ca}, respectively) in garnets, the Jericho eclogite xenoliths are dominantly type B, with lesser type C and one eclogite sample classifies as type A (scheme from Coleman et al. 1965). Preliminary geothermometry calculations yield a temperature range of 900-1070^{o}C at a constant pressure of 50 kbar. One olivine-bearing eclogite xenolith records a temperature of 1140^{o}C at 50 kbar (calculated from Ellis and Green 1979 and Ravna 2000). Kyanite±corundum-bearing eclogites have calculated pressures of 35 to 40 kbar at 950^{o}C (Ravna and Terry 2004). The equilibrium conditions calculated in this study fall within the range of 850 -1180^{o}C for Jericho eclogites calculated by Kopylova et al (1999).

Future research will include application of various radiogenic (e.g. Sm-Nd, U-Pb and Lu-Hf) and stable (e.g. O) isotope systems to these eclogite samples, to elucidate their formation age, origin and subsequent modification in the subcontinental lithosphere.

ENHANCEMENT OF THE PERMAFROST MONITORING NETWORK AND COLLECTION OF BASELINE TERRAIN INFORMATION IN THE MACKENZIE VALLEY CORRIDOR

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Permafrost is soil or rock that remains below 0°C throughout the year and is an important feature of the Mackenzie valley landscape. The Geological Survey of Canada (GSC) has been establishing and operating a network of permafrost temperature monitoring sites in the Mackenzie region, Northwest Territories since 1985. Knowledge of spatial and temporal variation of permafrost conditions (temperatures, soils and ground-temperatures) has provided critical information for the design and assessment of future pipelines, and for predicting impacts of climate change.

Extensive gaps exist in the Mackenzie monitoring network including the area north of Norman Wells. Funding received through the Northern Energy MC is enhancing the existing network. GSC is establishing, in collaboration with other government departments and northern communities, several new monitoring sites within Mackenzie Valley corridor that represent a range of environmental conditions along the proposed pipeline route. Temperature cables will be installed in boreholes up to 20 m deep and soil sampling will provide key information on geotechnical properties of surficial materials. One monitoring site was recently established south of Norman Wells in collaboration with Enbridge. In the Mackenzie Delta region, recent installations in partnership with INAC are contributing to an ecosystem based monitoring

approach to assess environmental conditions in the Kendall Island Bird Sanctuary and across the treeline transition. Further work is planned throughout the region in 2007. Information on proposed study sites and preliminary data will be presented.

NATURAL CHANGES IN THE SIZE OF A LARGE LAKE IN THE OUTER MACKENZIE DELTA.

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Two of the anchor fields which will supply gas to the proposed Mackenzie Gas Pipeline are located within the boundaries of the Kendall Island Bird Sanctuary. Impacts of the development must be understood in the context of the natural dynamics of a delta system. Big Lake, on Taglu Island is close to one of the anchor fields and may be influenced by development activities. In order to begin to assess the natural changes, a time series of air photographs of Big Lake was analyzed to determine the rate of change to its shoreline and extent and to the adjacent lowlying terrain.

Air photographs from 1950 to 2004 were acquired from various sources and rectified to a common base, that being orthorectifed imagery from the year 2000. Rectification was based on common points which were assumed to be stable. These points included ice wedge polygon intersections and anthropogenic features. Root mean square errors in rectification were less than 3 m. Most of the photographs were taken in the month of August although one series was taken in June when ice was still present on the lake. The rectified images were imported into a geographic information system and the shoreline of the lake was digitized by hand, based on the contrast between the water and the land. Changes in the area occupied by the lake and the position of the lake shoreline were calculated. There is no water level information for any of the photographs, so the degree to which the changes may be due to water level fluctuations can only be assessed based on comparison of features. One of the primary results of the analysis was the progressive preferential growth of the lake towards the southeast. This growth included the breaching and incorporation of several moderate-sized lakes. In contrast, the northwest shorelines have remained relatively stable during the 54 year time period encompassed by the photos.

Big Lake has increased in size an average of 30000 m^2 per year from 1950 to 2004, with a maximum 43000 m^2 per year during the interval from 1985-1992. Linear retreat of the shoreline towards the SE exceeds 150 m, but is typically 50-75 m in other directions. The lowlying areas adjacent to Big Lake consist of marshy sedge meadows with well-developed ice wedge polygon networks. Small ponds and ice wedges appear to be relatively stable in that they are consistent over much of the air photo interval despite occasional flooding.

APPLICATIONS OF SEABED MAPPING IN TUKTOYAKTUK HARBOUR, NORTHWEST TERRITORIES, CANADA

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New developments in seabed mapping provide detailed visualizations of morphology that can be used to better understand the interaction between the seabed and the overlying water column. Multibeam bathymetry and interferometric sidescan surveys were undertaken over a period of several years by the Canadian Hydrographic Service, the Geological Survey of Canada, Shell Canada Limited, and Aquatics Environmental Limited for a variety of purposes. The data were compiled and processed into a digital elevation model (DEM) of the seabed and combined with a new terrestrial DEM based on LIDAR (Light Detection and Ranging). A similar map based on sidescan and backscatter data was compiled to show seabed textural variation. These combined onshore-offshore morphological and backscatter maps provide an unprecedented view of the nearshore and harbour seabed environment.

Within Tuktoyaktuk Harbour, deep (> 30 m) basins are connected by river-like channels that are similar to the thermokarst lakes and channels seen onshore. Dredged areas are easily discernible after nearly 2 decades. Linear marks on the seabed in deep water within the harbour are thought to be formed by dragging anchors. Outside of the harbour, nearshore shoals are covered with high-backscatter materials that have been confirmed by sampling to be cobble lags. These shoals are likely the remains of spits or tundra islands that have been eroded by waves. Linear scour marks concentrated in the harbour approaches are likely caused by ship propellers used to slow and turn the ships and barges as they enter the Harbour. Seabed mapping data and the associated interpretations are essential components of a marine and coastal management strategy. Understanding the processes controlling coastal and nearshore change is essential for the development of appropriate shore protection strategies. Likewise inventories of the extent of human activities (dredging and seabed scour) are critical for identifying, measuring and monitoring environmental impacts.

GLACIAL MAPPING AS AN AID TO DIAMOND EXPLORATION

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In the summer of 2005 a program of glacial mapping was undertaken by Tahera Diamond Corporation in Nunavut Province. Mapping involved interpretation of Landsat imagery and aerial photographs followed up by field work and the production of glacial landform and deposit maps. Glacial directional data provided useful insights into the nature of kimberlite dispersal trains in several claim group areas with both known and unknown sources.

Landsat imagery revealed linear erosional markings or megagrooves that range from .5 to several kilometers in length. The trends of these satellite lineations were mirrored by drumlins, crag and tail features and glacial striae mapped at the outcrop scale. Using these sources of data, glacial flow patterns were mapped within and between claim group areas. During the last glaciation there was a sequential, clockwise rotation of ice flow from southwestward to northward. The trends of kimberlite dispersal trains generally match these mapped glacial flow directions. Areas of unidirectional northwestward flow were characterized by narrow, ribbon trains with limited widening in a down-ice direction from the kimberlite source. Areas with a more complex rotational flow history imprinted on the landscape showed wide, fan-shaped trains and bi-modal or palimpsest dispersal trains. The fan "envelope" and bimodal trends of dispersal within the envelope are controlled by mapped ice flow directions. In some cases fan geometry is apparently controlled solely by late flows and in others early ice flow events are also represented.

Prior to a till survey glacial trend mapping is important to establish the spacing and orientation of sampling lines. After till surveys, glacial flow directions are useful when the dispersal train geometry is not apparent. In the case of an irregular or beheaded train ice flow trends can be used to delimit fan boundaries. Mapping is essential to identify glaciofluvial, glaciolacustrine or glaciomarine sediments which can mask a till dispersal train.

GEOLOGICAL MAPPING OF DEVRIES LAKE, BEAR PROVINCE, WOPMAY OROGEN

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1:10 000 scale detailed shoreline mapping of the metasedimentary siltstone package from the "Treasure Lake" Group was done over a period of 4 days at the northern section of DeVries Lake. DeVries Lake lies within the Great Bear Magmatic zone of the Wopmay Orogen just west of the North-South trending Wopmay Fault zone. Deformation associated with the Wopmay

fault may have affected the Treasure Lake Group sedimentary rocks. The sedimentary rocks, for the most part, are finely laminated siltstones in the lower-grade metamorphic zones grading to a biotite schist, with localized injection migmatitic layering in the higher-grade metamorphic zones. These siltstones and schists have undergone extensive alteration leaving them magnetite-rich and obliterating primary compositions. However, the injection of melt into the schist is interpreted to be bedding parallel, allowing for a correlation of structures across the grade changes (can track folds). In less deformed areas there is evidence of soft sediment deformation as convolute bedding present.

The purpose of this project is to document the observed structures of the siltstones at DeVries, in a detailed thematic map and cross-section. A complete petrographic study of fabrics will provide insight into the deformation history at DeVries as well as relative timing of associated magmatic events. This will also include an investigation into the metamorphic history of the area and it is possible that the timing of metamorphism may also be constrained. The study of the structural evolution will ultimately be linked to the hydrothermal alteration of the sedimentary rocks at DeVries Lake.

A DEFORMED MAFIC DYKE (RAINING BEAR DYKE) IN THE PALEOPROTEROZOIC SNARE GROUP: TIMING CONSTRAINTS ON SUPRACRUSTAL DEPOSITION AND REGIONAL METAMORPHISM, WOPMAY OROGEN, NWT

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This study forms part of the South Wopmay Bedrock-mapping project operated by the NWT Geoscience Office. The study is focused within the supracrustal rocks of the Paleoproterozoic Snare Group, which lie east of the Wopmay fault zone and for which a depositional age has yet to be determined. At a well-exposed locality near Black Lichen Lake, mafic dykes and sills intrude a sequence of psammitic schist, quartzite, and what are interpreted as felsic to mafic volcaniclastic rocks. Both the supracrustal rocks and the dykes have been deformed and metamorphosed under at least mid-amphibolite-grade conditions (sillimanite zone in the supracrustal rocks and hornblende facies in the mafic rocks). Some of the deformed mafic dykes are crosscut by unfoliated medium-grained leucogranite veins.

Mafic dykes commonly contain the mineral baddeleyite (ZrO_2), which can breakdown to form metamorphic zircon at greenschist or higher metamorphic grades. If present, both of these minerals can be dated using U-Pb geochronology to obtain the emplacement age (baddeleyite) and time of metamorphism (metamorphic zircon). We are employing Laser Ablation Multi-Collector Inductively Coupled Plasma Mass Spectrometry (LA-MC-ICPMS) U-Pb analysis to determine the timing of dyke crystallization (and therefore a minimum age on the supracrustal

sequence) and metamorphism. The mafic dyke that will be dated (Raining Bear dyke) is 5-15 meters thick and trends approximately 345º, subparallel to compositional layering in the supracrustal rocks. The dyke is a foliated metagabbro that was deformed and metamorphosed along with the supracrustal rocks, and consists of coarse hornblende porphyroblasts with minor amounts of plagioclase feldspar. The dyke has a penetrative fabric, defined by alignment of hornblende and plagioclase. The relative timing of metamorphism and deformation will be determined by examining the relationship between hornblende porphyroblasts and the matrix foliation.

As part of this study, a detailed 1: 5000 scale map of the study area will be produced showing the field relationship between the Raining Bear dyke and the supracrustal package. LA-MC-ICPMS U-Pb zircon analysis will also be conducted on the undeformed cross-cutting leucogranite to determine a minimum time constraint on the deformation event that formed the foliation in the Raining Bear dyke. Geochemical analysis will also be undertaken to determine the tectonic origin of the leucogranite veins that cut through the Raining Bear dyke. This research will help to better constrain the timing of mafic magmatism, deformation, metamorphism, and possibly the age of the Paleoproterozoic Snare Group deposition.

STRUCTURAL INTERPRETATION OF THE PEEL PLATEAU – MACKENZIE CORRIDOR, NWT: AN OVERVIEW

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The frontal ranges of the Mackenzie Mountains, NWT, exhibit an abrupt change in structural trend from predominantly N-S in the Mackenzie Plain to E-W in the Peel Plateau area, resulting in a very pronounced arcuate shape. This arcuate shape has been linked genetically to Laramide deformation and the geographical distribution of the salt intervals of the Saline River Formation. Preliminary integration of 2D seismic data, well data and surface geology illustrates the variation of structural trends and styles along the thrust front of the Peel Plateau and the Mackenzie Plain and raises the possibility of alternative interpretations.

Several interpreted seismic profiles illustrate the transition from the relatively undeformed Phanerozoic in the Peel Plateau area, to long wavelength and high amplitude compressional folds flanked by flat-bottomed and broad synclines in the Imperial Anticline – Gambill – Summit Anticline area.

All the Laramide deformation seems to have taken place above the sub-Cambrian unconformity. Low angle thrust faults, with bedding-parallel detachments occur preferentially within the Upper Cambrian Saline River Formation.

The degree of deformation decreases progressively between the Mackenzie Mountains and the Franklin Mountains. In the Franklin Mountains, the Norman Range can be interpreted as an imbricate fan of detachment folds with low amplitude, small wavelength culminations. The folds exhibit vergence toward both the hinterland (SW) and the foreland (NE). This thin-skinned interpretation contrasts with the high angle faults and predominantly thick-skinned deformation proposed previously for the area, with important implications on mechanisms of deformation, fold geometry and the amount of shortening.

THE SAHTU LAND USE PLAN OVERVIEW

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As a result of the signing of the Sahtu Dene Metis Comprehensive Land Claim Agreement in 1993, the Mackenzie Valley Resource Management Act (MVRMA) was developed and brought into effect. The Sahtu Land Claim authorised the establishment of the Sahtu Land Use Planning Board which, through the MVRMA, is tasked with developing and implementing a Land Use Plan for all lands outside of municipal boundaries in the Sahtu Settlement Area.

The Sahtu Land Use Planning Board is currently in the process of preparing a DRAFT Land Use Plan and are conducting consultations in order to:

-facilitate peoples' understanding of Land Use Planning;
-ensure that the interests of all parties are taken into consideration in the planning process; and
-build strong effective partnerships.

The immediate goal of the Sahtu Land Use Planning Board is to advance the current Draft Land Use Plan to completion in a timely manner, recognizing the diverse interests of all Sahtu stakeholders. The Board's Vision and Values contain a commitment, as a Public Board, to represent all regional views and interests and the Board has commited to talk to everyone including Sahtu communities, adjacent planning authorities, industry, government and non-government organizations during the process of completing the Sahtu Land Use Plan.

As part of the process of advancing the Sahtu Land Use Plan to completion the Sahtu Land Use Planning Board has held meetings with the mineral exploration and development interests in the Sahtu. Another meeting will take place during the 2006 NWT Geoscience Forum.

In this poster session the Sahtu Land Use Planning Board is presenting the latest map of the Sahtu Settlement Area DRAFT Land Use Plan and an additional map with Mineral Tenure overlain on the Draft Plan map. Board representatives will be in attendance to discuss the plan and hear your comments.

A DEVELOPING CAMBRIAN BIOSTRATIGRAPHIC FRAMEWORK IN THE MACKENZIE VALLEY

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Devon Canada and Talisman Energy have been involved with extensive field and reconnaissance mapping in the Mackenzie Valley of the Northwest Territories. Recent work focused on mapping and correlating the Proterozoic and Cambrian sections in the central Mackenzie and McConnell Mountains. Stratigraphic units studied include the Proterozoic Katherine Group, unnamed Proterozoic units, Mount Clark Formation, and Mount Cap Formation.Over 700 samples were collected in the 2006 field season, including hundreds of fossils. Analysis is ongoing; however, it is apparent that new fossil collections are critical to understanding paleoenvironments and provide biostratigraphic control.

Early biostratigraphic results include: abundant trilobites including key zonal species; exceptionally preserved soft-bodied fossils that suggest similar taphonomic conditions to those of the Burgess Shale; unique cone-shaped fossils that are lithofacies specific; and disk-shaped fossils from Proterozoic strata. Trilobites are primarily used for Cambrian biostratigraphy in the Canadian Cordillera. The soft-bodied fauna is from a locale incorrectly mapped as Proterozoic. The presence of these soft-bodied fossils suggests unique taphonomic circumstances that enhance preservation. The fossils may be age equivalent to those in the Burgess Shale. Cone-shaped fossils from several locations may be useful to correlate strata throughout the study area. Finally, disk-shaped fossils were only recovered from Proterozoic strata and may be unique. It is anticipated that further analysis of the fossils (including microfossils) will establish biofacies that will support and enhance the resolution of the stratigraphic correlation in Cambrian sediments of the central Mackenzie Valley.

SURFICIAL GEOLOGY OF THE FOXE PENINSULA, SOUTHWEST BAFFIN ISLAND: PRELIMINARY RESULTS FROM THE SWBIG PROJECT

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Understanding the surficial geology and glacial history are critical aids to mineral exploration in Nunavut, especially in poorly exposed regions. As part of the Southwest Baffin Integrated

Geoscience Project (SWBIG), the Canada – Nunavut Geoscience Office and the Geological Survey of Canada, in collaboration with researchers from Simon Fraser and Dalhousie universities, initiated a surficial mapping project on Foxe Peninsula, SW Baffin Island, in 2006. This region has exploration potential for base metals, but is lacking in basic geoscience data.

Based on observations of ice flow indicators, marine-limit features, the distribution and identification of erratics, a complex, preliminary glacial chronology of the Foxe Peninsula can be constructed. At the Last Glacial Maximum, ice flowed towards the east in Hudson Strait. Ice flow was strongly affected by the Amadjuak Ice Divide to the north, and possibly from the Foxe Ice Divide to the northwest. During deglaciation, ice is inferred to have evacuated from the Hudson Strait relatively quickly. As marine inundation continued around Foxe Strait and Foxe Basin, the remnants of the Foxe dome retreated onto Baffin Island. This resulted in disintegration of the Amadjuak Ice Divide, and formation of the Amadjuak Dome. In parts of the eastern Foxe Peninsula, this affected a change of ice-flow direction of more than 90 degrees. In western Foxe Peninsula, marine incursion played a similar significant control on deglaciation, but with less dramatic changes in ice-flow directions.

In 2006, SWBIG surficial geologists collected 250 ice-flow indicator measurements, 141 samples for till geochemistry and Kimberlite Indicator Mineral analysis, and made more than 1100 field examinations that will be used as ground-truthing sites, essential for constructing the surficial geology map. To better understand ice flow, field examinations also included estimating the quantity and type (e.g., Precambrian vs. Paleozoic) of erratics. To quantify glacial chronology, samples were collected for radiocarbon analysis, Terrestrial Cosmogenic Nuclide dating, and Optically Stimulated Luminescence dating. Chronological and geochemical analyses are in progress.

GEOTECHNICAL INVESTIGATIONS OF LANDSLIDES IN FINE-GRAINED PERMAFROST SOILS IN THE MACKENZIE VALLEY, NWT

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There are numerous landslides in the Mackenzie Valley, Northwest Territories (NWT). A majority of the slides are in fine-grained soils in permafrost, especially along the northern half of the valley. Those landslides, which are mostly around lakes, start from shallow slope failure at small scale that retrogresses slowly with time into larger zones. Understanding the triggering mechanism of the landslides has significant implications to the development of infrastructures in the region, e.g., pipelines or transportation systems. The Geological Survey of Canada (GSC) has initiated a geotechnical research project to study the triggering mechanisms of these landslides. Two representative landslide sites have been selected for detailed geotechnical studies. Soil samples have been collected from both sites for geotechnical laboratory testing. Some geotechnical and geothermal parameters of the soils have also been measured in the field at both sites. Test plots have been excavated near the selected landslide sites in late 2005 and

early 2006 to simulate ground condition changes. The test sites have been instrumented to monitor changes of ground temperature, soil moisture, pore water pressure, slope movement and weather conditions. The test plots and instrumentation plans were determined based on initial numerical analyses which were carried out to have preliminary understanding of the geomechanical and geothermal behaviour of the slopes. Further analytical and numerical investigations will be performed, implementing the data obtained from the laboratory tests and in-situ measurements at the monitored sites. The outcome of this research work is expected to contribute to increased knowledge of the landslide occurrence with emphasis on their triggering mechanism. This will ultimately lead to improved land use planning and reduced environmental impacts associated with any infrastructure development in the permafrost regions.

STRUCTURAL AND METAMORPHIC EVOLUTION OF THE ORMSBY ZONE, YELLOWKNIFE GREENSTONE BELT, SLAVE PROVINCE

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Gold on the Discovery property, Northwest Territories, has been historically mined from quartz veins formed in or adjacent to Archean metavolcanic lithons enclosed in metasedimentary rocks. The metasedimentary rocks are correlated to the Archean Banting Group, based on a U-Pb age of 2.66 Ga on zircon (SHRIMP-RG). The Banting Group is present in the Yellowknife Greenstone Belt, located near the well-known Con and Giant Mines near Yellowknife, 100 km to the south. In contrast, the age and lithologic association of the metavolcanic rocks is unknown, and they could be correlated to either of Kam or Banting Groups, which lie at different stratigraphic levels within the stratigraphy of the Yellowknife Greenstone belt.

The two gold deposits forming the Discovery Property contain >1.5 million ounces in past production and resources. The historical Discovery Mine was developed in quartz veins hosted in the metasedimentary rocks folded around the northern tip of the metavolcanic lithons. In contrast, the newly defined Ormsby Zone consists of gold in silicified and sulphidized domains cutting hydrothermally-altered and metamorphosed pillowed and brecciated volcanic rocks. At the Ormsby Zone, quartz addition occurs as discrete, discontinuous but commonly folded quartz veins, isolated pods, or discrete zones of quartz replacement. The later silicified zones are commonly hosted by metamorphosed pillow breccias. Pyrrhotite ± arsenopyrite is also associated with the silicified zones. Ancillary garnet, biotite, and carbonate minerals are also present but these minerals are not restricted to the gold-bearing rocks. The auriferous zones form sub-parallel, en echelon zones that generally strike 025° (±15°) and dip 75° (±15°) to the west.

The upper greenschist to amphibolite facies rocks hosting the gold on the Discovery property have undergone at least four ductile, penetrative fabric-forming, deformational events. These fabrics are best preserved in the metasedimentary rocks, where the peak metamorphic

assemblages of quartz-biotite-muscovite±cordierite and quartz-biotie-muscovite±staurolite indicate the rocks reached upper greenschist-amphibolite facies conditions. In the metavolcanic rocks, only one fabric is preserved, and the assemblage of hornblende±actinolite-quartz-plagioclase-garnet similarly records upper greenschist-amphibolite facies metamorphic conditions. Three generations of folding and shearing are described, as well as a vertical fabric (lineation) across the property which is a combination of the intersection of foliation planes and a vertical stretch. The kinematic history of the rocks including and surrounding the Ormsby Zone is sequenced chronologically in order to constrain the relative timing of gold mineralization, which appears to be late.

PRELIMINARY RESULTS OF THE GEOLOGY OF LATE DEVONIAN IMPERIAL FORMATION, SOUTHERN PEEL PLATEAU AND PLAIN, NWT

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Late Devonian stratigraphy of the Peel Plateau and Plain is comprised of the upper portion of the Hare Indian Formation, the Canol Formation, and the Imperial Formation. The Imperial Formation is overlain unconformably by the Cretaceous Martin House Formation.

Field work conducted in 2006 consisted of measuring stratigraphic sections on Imperial River, Powell Creek, an Elbow Creek tributary as well as an Arctic Red River tributary. These sections occur on NTS map sheets 96 E/1, 106 H/5 and H/7, and 106 G/7. Samples were collected from Imperial Formation for analysis of permeability, porosity, palynology, and Rock-Eval/TOC.

Imperial Formation is interpreted as a turbidite sequence that can be coarsely described as three, thick resistant cliff-forming sandstone units, which are separated by less resistant to recessive thick silty shale packages. The sandstones are very fine to fine-grained and show abundant bioturbation near the base of beds including both horizontal tracks and traces as well as vertical burrows. Bioturbation decreases up section and sedimentary structures are better preserved. Imperial Formation sandstone is locally fossiliferous containing rugose horn corals, colonial corals, and brachiopods. Sandstone units within the Imperial River section are locally petroliferous.

The sandstones of Imperial Formation are medium grey, green grey, and olive green in colour. The greyer sandstones occur in the basal sand unit in the Shortcut Creek and Monument section to the west. In these two sections there is a distinct lack of green sand in the basal member. The western sections also exhibit a notable decrease in coral and shell abundances. This possibly indicates a movement away from a shelf edge bioclastic sediment source, which may correspond to a northern extension of the Jungle Ridge member.

Initial results from 2006 field season yielded porosity values between 14% and 25 % on sandstones from Imperial River Section. One sample of Imperial formation on Powell Creek

yielded TOC 3.6%, HI 262, S1 0.83 and S2 9.42. These Rock-Eval results are well within the oil window and are excellent indicators of potential source rock, and provide direction for future field work. Petrographic examinations are pending.