GEO-NOTE 2001-01

Bedrock and Stream Sediment Geochemical Analysis and Field Observations of the Sub-Cretaceous Unconformity, Northeast Alberta (NTS 74E and North Half 74D)

Alberta Energy and Utilities Board

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ABSTRACT

The objective of this Geo-Note is to make the geochemical results available from 1996, 1997 and 1999 sampling and to report on geological field observations that may be of interest to the minerals industry.

The sub-Cretaceous unconformity in the Fort McMurray area of northeastern Alberta, is defined by the major break in sediment deposition between the lower Upper Devonian Waterways Formation carbonate of the Upper Beaverhill Lake Group and lower Cretaceous McMurray Formation sandstone and siltstone rocks of the lower Mannville Group. The area is thought to be an attractive site for mineralization since a transition from a lower oxidized system (Elk Point Group to Precambrian) to an upper reduced system (upper Beaverhill Lake and lower Mannville groups) exists. The reducing potential of the Beaverhill Lake Group carbonates directly below the sub-Cretaceous unconformity was enhanced by the downward infiltration of highly reducing hydrocarbons from the heavy oil-impregnated lower Mannville Group.

A total of 195 bedrock and core samples of Devonian and Cretaceous rocks were collected during various excursions to the field and to the core facility in Calgary between 1996 and 1999. An additional 64 stream sediment, and 89 stream sediment heavy mineral concentrate (HMC) samples were collected. The majority of these samples were collected to the north of Fort McMurray in the Bitumount 1:250 000 map sheet (NTS 74E) and to the east along the Clearwater River.

A correlation exists between aeromagnetic lineaments, surface fault structures characterized by sideritization and possibly silicification, and sulfide mineralization. Disseminated and massive sulfides (pyrite and marcasite) were located ‘in situ’ and form preferentially along carbon-rich layers and fractures in the carbonate. The formation of these nodules, in addition to marcasite being crystallized from melnikovite, are believed to be indicative of a low temperature sedimentary origin, or the precipitation from low-temperature hydrothermal brine solutions. A green clay layer, which is typically located in karsted sections and separates the Devonian Waterways Formation from the overlying Cretaceous McMurray Formation, contains the highest concentration of metals. These include values of up to 1,342 ppm Zn, 37.4% Fe, 342 ppm V, 105 ppm Cr, 126 ppm Ni, 10 ppb Au and 13 ppb Pd. Ambiguities remain concerning the hydrothermal versus diagenetic origin of both sulfides and the green clay.

1. INTRODUCTION

The sub-Cretaceous unconformity in the Fort McMurray area of northeastern Alberta, is defined by the major break in sediment deposition between the Devonian Waterways Formation carbonate and overlying Cretaceous McMurray Formation sandstone. This area has been used for the formulation of a new mineral deposit model, Prairie-type sedimentary Au-Ag-Cu (Abercrombie, 1996; Abercrombie and Feng, 1997). Precipitation of Prairie-type mineralization occurs as low-temperature oxidized brines flow across major redox boundaries into reducing conditions that prevail both locally, in structurally controlled settings, and regionally, at major stratigraphic boundaries (Abercrombie, 1996). The Waterways Formation is thought to be an attractive site for Prairie-type mineralization since it represents a transition from a lower oxidized system (Elk Point Group to Precambrian) to an upper reduced system (Beaverhill Lake Group). The redox potential directly below the pre-Cretaceous unconformity has been enhanced by the inflow of highly reducing hydrocarbons associated with the emplacement of the Athabasca tar sands. According to the model proposed by Abercrombie, mineralizing fluids react with carbonate, alter the wall rocks and precipitate a diverse suite of metals (Fe, Zn, Mn, Ag, Cu, Pb and Au), ore minerals (trace sphalerite, galena, Cu-sulfide, pyrite and native gold and silver), and gangue (calcite, siderite, goethite and silica).

In 1996 and 1997, 126 bedrock and core samples of Devonian and Cretaceous rocks were collected from the Fort McMurray area during various excursions to the field and to the core facility in Calgary (Figure 1). The majority of these samples were collected to the north of Fort McMurray in the Bitumount 1:250 000 map sheet (NTS 74E) and to the east along the Clearwater River. In 1999, a study funded by the Canada-Alberta Western Economic Partnership Agreement completed a reconnaissance-scaled geochemical study of the Bitumount map area. An additional 69 bedrock, 64 stream sediment, and 89 stream sediment heavy mineral concentrate (HMC) samples were collected (Figure 1).

The objective of this Geo-Note is to report on geological field observations and make the geochemical results available from 1996, 1997 and 1999 sampling. This report will also discuss any geochemical anomalies that may benefit exploration in the Fort McMurray area and the Phanerozoic succession of northern Alberta, in general.

2. GENERAL GEOLOGY OF THE BITUMOUNT MAP AREA

The exposed bedrock in the Bitumount map area ranges in age, from approximately 1.975 to 1.932 Ga Precambrian intrusive, gneissic and volcanic rocks to approximately 92 Ma Cretaceous sedimentary rocks (Figure 1). A general overview of the bedrock and surficial geology is provided below.

The Precambrian Shield crops out in the northeast corner of the Bitumount area and represents the only known exposure of basement rocks in the Prairie region of Alberta south of Lake Athabasca. Archean granite, gneiss, mafic dykes and mylonite rocks in the Marguerite River area have been documented by Carrigy (1959), Tremblay (1961), Godfrey (1970), Green et al. (1970), and Langenberg and Nielsen (1982). During the 1970’s, drilling for uranium targets penetrated Proterozoic Athabasca Group rocks northeast of Richardson River. Subsequently, Green et al. (1970) and Wilson (1985) defined the southern boundary of the Athabasca Group sandstone in the northeast corner of the Bitumount area.

An erosional unconformity, which includes a thin veneer (about 2 m) of arkosic sandstone (Cambrian to Devonian Granite Wash Formation, divides Precambrian basement from overlying Devonian carbonates. Although bedrock exposure of the Devonian rocks is largely limited to drainage areas associated with the Athabasca River, isopach maps show that the Devonian is within 100 m of the ground surface for approximately one-third of the map area (Dufresne et al., 1994; Oldale and Munday, 1994). Devonian rocks in the Bitumount area are comprised of 1) shale, siltstone, dolomite, salt and anhydrite beds of the Middle Devonian Elk Point Group (Norris, 1963, 1973); 2) limestone, siltstone and dolomitic limestone of the Slave Point Formation (Carrigy, 1973; Norris, 1973); and 3) calcareous shale and argillaceous limestone alternating with clastic limestone of the Upper Devonian Waterways Formation (Green et al. 1970).

The Devonian carbonates are separated from the overlying Lower Cretaceous clastic units by a major erosional unconformity. Carrigy (1973) reported that subaerial erosion and karsting of the carbonate greatly affected the sedimentation of the lowermost Mesozoic units. For example, the Beaver River silica- and goethite-cemented sandstone appears to unconformably underlie the Lower Cretaceous McMurray Formation, and may represent an earlier Cretaceous (or possibly Jurassic) remnant.

Cretaceous sedimentary rocks in the Bitumount area include 1) the McMurray Formation deltaic quartz-rich sandstones, which underlie much of the southern part of the map area and are host to the Athabasca Tar Sand deposits; 2) marine shale, laminated siltstone and cherty sandstone of the Clearwater Formation; and 3) sandstone, laminated siltstone and shale of the Grand Rapids Formation, which underlies much of the drift covered region in the southeast part of the Bitumount area (Carrigy, 1963; Green et al., 1970). The mid-Cretaceous Shaftesbury Formation shale and siltstone overlie the Grand Rapids Formation in the Birch Mountains area, which is located in the northwest corner of the map area.

The surficial geology in the Bitumount map area was mapped by Bayrock (1971), Bayrock and Reimchen (1974) and McPherson and Kathol (1977). Gypsy till, which is composed of material eroded from the Athabasca Formation, covers much of the southeastern and eastern part of the map area. The Athabasca River and Firebag River in the central part of the map area erode into deposits of outwash sand and gravel. Lacustrine silt, clay and sand in the south, and alluvial fan and slump sediment in the north underlie the western part of the Bitumount map area.

3. SAMPLING AND ANALYTICAL METHODS

In general, the 1996 to 1999 sampling in the Bitumount and Fort McMurray areas was ‘random’ in the sense it was largely dictated by infrequent outcrops and existing core holes. As well, sample collection was primarily focussed on road accessible areas. Approximately 10 days were dedicated to remote areas where sampling was aided by the use of a helicopter. Bedrock sampling comprised the collection of about 2 kg grab samples within individual lithologic units. Stream sediment samples were collected by hand, just below the top of the sediment-organic layer, and placed wet in metal-free paper envelopes. Stream sample sites were collected from as near the middle of the stream as possible and every effort was made to avoid collapsed bank material.

Sample preparation included: air-drying; splitting the sample into two; and pulverizing one split to -150 mesh. The uncrushed sample split will be retained at the AGS Mineral Core Research Facility for any future analysis. The pulverized sample split was sent to Activation Laboratories and analyzed for 1) Au+47 elements by Instrumental Neutron Activation Analysis (INAA) and Inductively Coupled Plasma Emission Mass Spectroscopy (ICP-MS); 2) Au, Pt, Pd by Fire Assay; and 3) C and S by Leco. Sulfur isotope values ($\delta^{34}S$) for selected samples were analyzed at the University of Calgary by Continuous-Flow Isotope Ratio Mass Spectrometry (CF-IRMS) of $BaSO_4$ prepared by Br-HNO_3 digestion of the original sample. All isotopic values are reported in the per mil notation relative to the Canyon Diablo Troilite (CDT) international standard. Bulk (<120 µm) and clay (<2 µm) from selected samples were

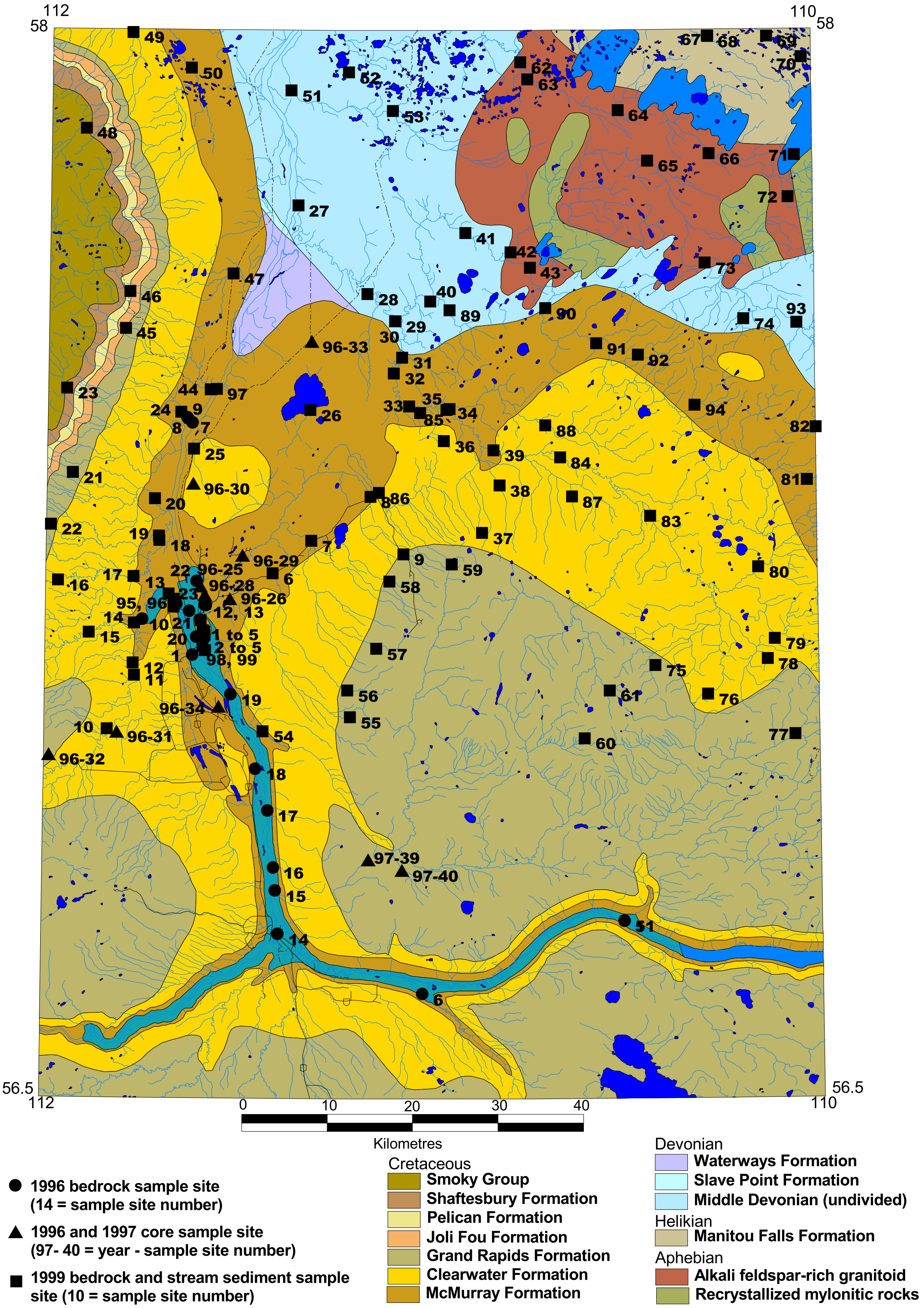

Figure 1. Bedrock geology of the Fort McMurray area with 1996, 1997 and 1999 sample sites.

analyzed by X-ray diffraction at the Alberta Research Council.

Stream sediment heavy mineral concentrate (HMC) samples were collected and analyzed for potential diamond indicator minerals. Samples were wet-sieved, by carefully shoveling sediment into a series of three stainless steel sieves resting in a large conical pan. Sample sites were dug to a depth of 1 m to ensure a representative sample. The ‘light’ fraction was panned off, and approximately 500 g of heavy mineral concentrate (< 2 mm) were collected from each site. Microscopic examination of the heavy-mineral concentrate samples for diamond-indicator minerals was completed by the Saskatchewan Research Council (SRC) using their standard exploration grain sizes of 0.25-0.5 mm, 0.5-1.0 mm, and 1.0-2.0 mm. Summaries of the processing procedures are given in Swanson and Gent (1993). A simplified description of the lab procedure involves:

1) separating the sample to obtain the minus 2.0 mm fraction;
2) permrolling the sample to separate the non-magnetic and quartz fractions from the paramag netic and magnetic fractions;
3) Frantz electromagnetic separation to generate distinct fractions (usually magnetic, paramag netic, and nonmagnetic) based on variations in magnetic susceptibility;
4) ‘magstream’ to divide the nonmagnetic fraction into intermediate and heavy specific-gravity fractions; and
5) microscopic examination of the heavy mineral concentrate to hand pick for selected diamond-indicator minerals.

4. FIELD OBSERVATIONS

The sub-Cretaceous unconformity is one of the easiest geological contacts to map in northern Alberta because the ‘white’ Devonian carbonates and ‘black’ Cretaceous McMurray Formation oil sands are usually readily identifiable from the air via helicopter. While the contact is generally sub-horizontal and continuous, areas of ‘karst’ are characterized by local structure contour ‘down-warps’ (Figure 2a and 2b).

During fieldwork, we noticed that unconsolidated stream sediment in the apex of these ‘downwarps’ is often composed of rusty-weathered rock types. At some sites (e.g., RE99-74E-35 and RE99-74E-85), competent sulfide nodules and sulfide-cemented sandstone fragments were part of the detrital material (Figure 2c to 2e). We also noticed that ‘karst’ areas with high concentrations of rusty alluvial material coincide with major aeromagnetic lineaments, which may indicate the areas are actually controlled by fault structures.

In order to determine whether 1) the sulfide nodules represent alluvial or glacial detritus, or if they are locally derived from bedrock, and 2) areas of karst are structurally controlled by near-vertical faults, we investigated exposed sections near magnetic high lineaments. Despite the general lack of bedrock exposure in Bitumount area, two sites, RE99-74E-85 along the Firebag River and RE99-74E-96 along the McKay River, comprised rusty-weathered rocks and sulfide nodules in direct association with karst or shear structures. These sections are described below.

Site RE99-74E-85, is characterized by rusty-weathered, locally sheared, sideritized, silty shale and siltstone of the basal McMurray Formation (Figure 3). Sulfide nodules are ‘in situ’ (Figure 4a) and form preferentially along carbon-rich layers and fractures (Figure 4b). Concretionary sideritized layers and hard, silicified siltstone contain up to 10 vol. % disseminated pyrite and marcasite (samples RE99-74E-85-002 and RE99-74E-85-005). While some sedimentary rock sections in northern Alberta exhibit similar ‘slumping-textures’ as the result of colluviation, the shear fabric at site RE99-74E-85 dips steeply at

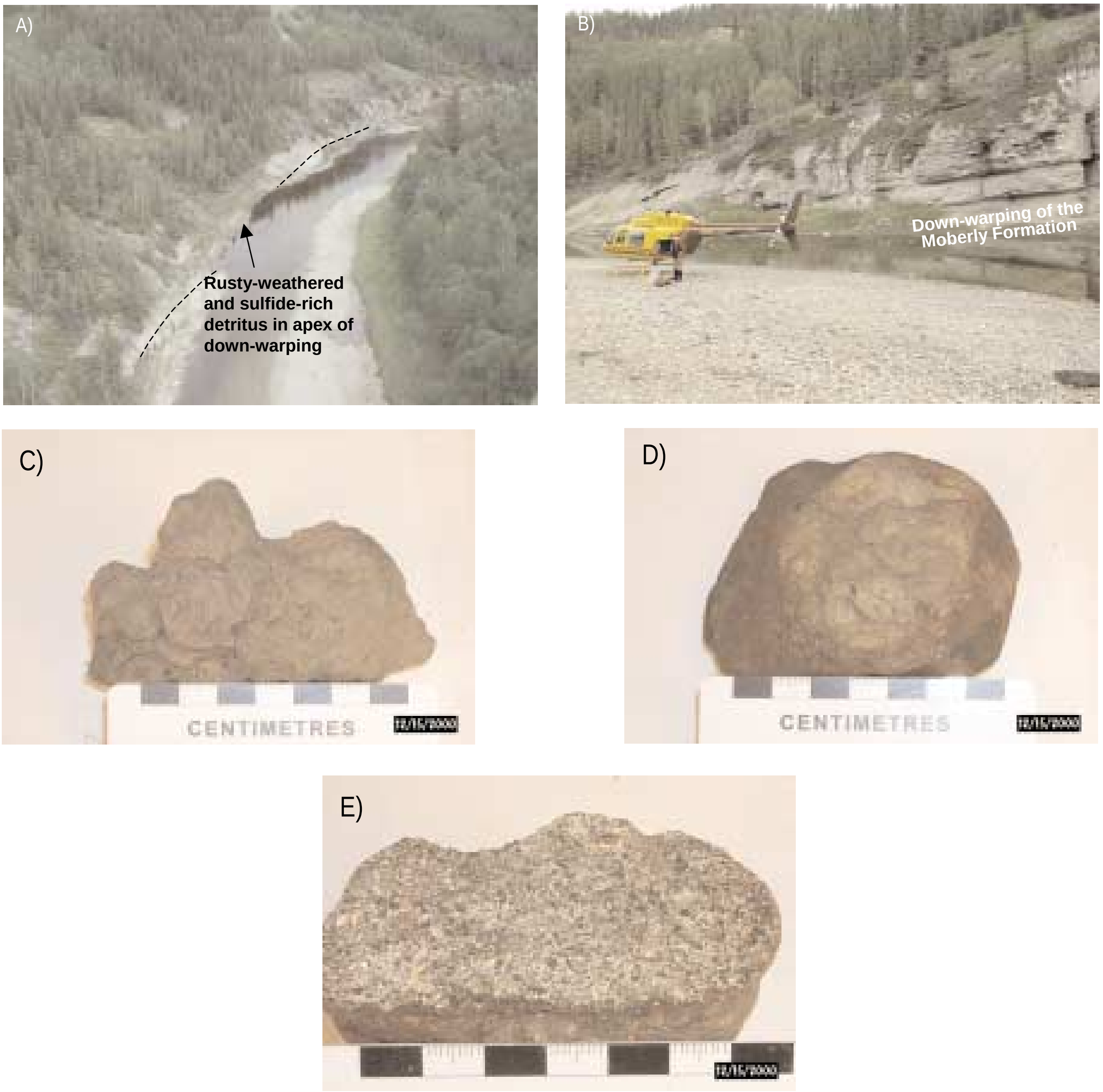

Figure 2. Topographic discontinuities and the occurrence of rusty-weathered sediments and sulfides at the sub-Cretaceous unconformity. Aerial (A) and ground (B) photographs showing the down-warping of strata at the sub-Cretaceous unconformity. Examples of sulfides discovered in stream detritus at the apex of the down-warping: C) sulfide nodule; D) massive sulfide; and E) sulfide replacing the matrix of a coarse-grained sandstone.

Figure 3. Shear-related fabric in the Cretaceous McMurray Formation along the Firebag River, with sample locations (002 to 014).

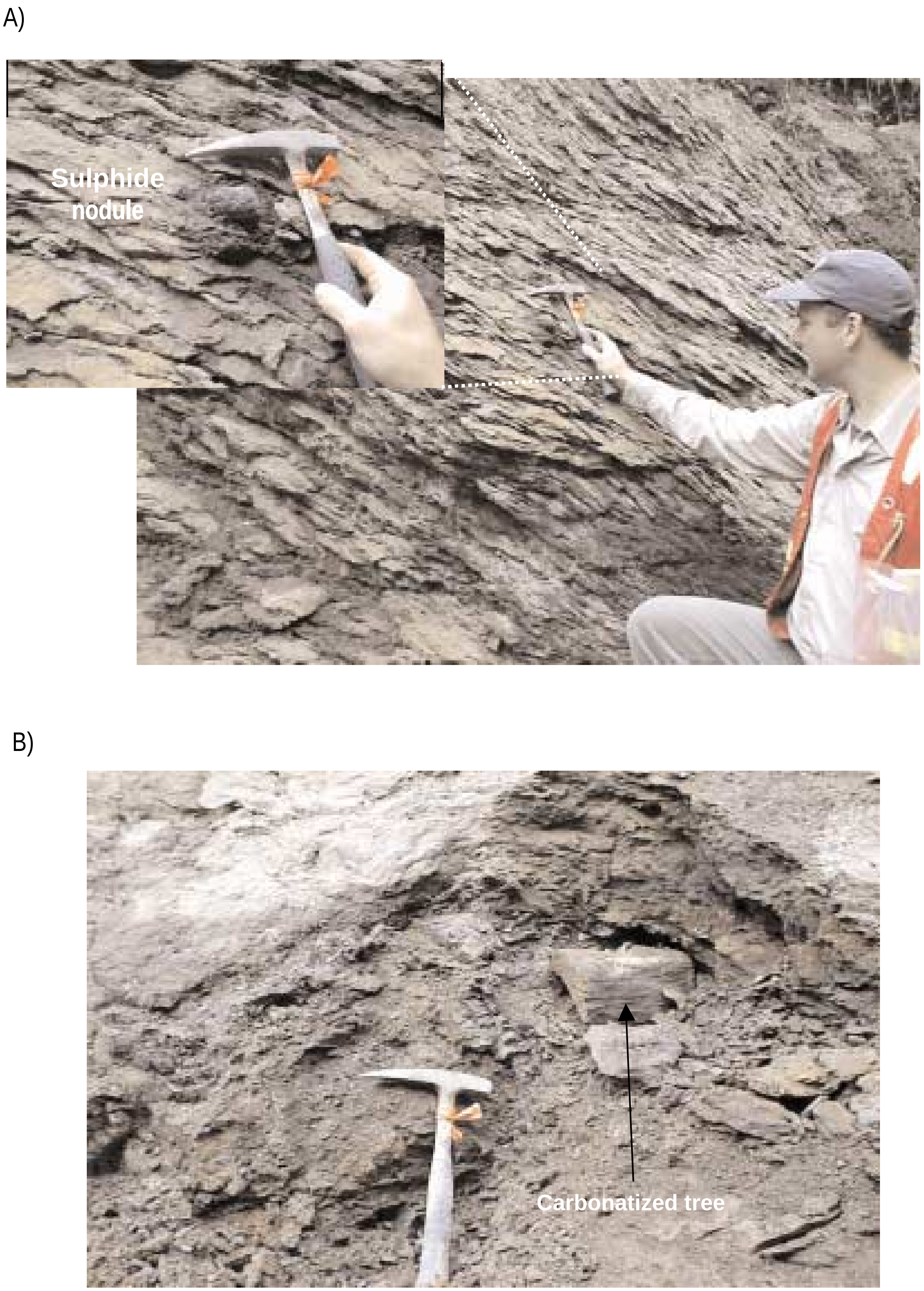

Figure 4. The occurrence of in situ sulfide nodules at a section along the Firebag River. A sulfide nodule (A) occurs within carbon-rich sediments (B).

77° SE and is not due to slumping since near-horizontal bedding is preserved in the section. The recognition of sheared sedimentary rocks is important as the structures believed to be responsible for the shear-fabric, may provide pathways for mineralizing fluids.

A karsted section along the sub-Cretaceous unconformity characterizes site RE99-74E-96. Three faults cut through both the McMurray Formation and the underlying Devonian Moberly Member (Figure 5). From stratigraphic base to top, the zone of karst is characterized by 1) unaltered to slightly rusty-weathering Moberly Member calc-shale; 2) de-calcified carbonate rocks that appear clay-like and even bentonitic in appearance; 3) a hard, competent sideritized rock that in some locales resembles altered Moberly calc-shale, or is totally altered and contains disseminated sulfide; 4) a distinct green clay; and 5) rusty-weathered black oil sands of the McMurray Formation (Figure 6a). The green clay is present in other karsted regions in the Fort McMurray area, where the irregular top of the Waterways Formation is highly altered (sideritized) and overlain by green 'rind-like' clay that separates Devonian and Cretaceous basal McMurray Formation (Figure 6b). A similar section was located along the Christina River (RE96-NE96-06), approximately 25 km east of Fort McMurray. According to Abercrombie (personal communication, 1996), the karsted interval at the Christina River section resembles a scaled-down model of the solution chimneys documented by Fedikow et al. (1996) and Ramnath (1999) at the Mafeking Quarry, Manitoba. Carbonate rocks at the Mafeking Quarry are characterized by distinct variations in colour and compositions that develop laterally along limestone beds and comprise two main types of mineral zoning (sinters and rinds). The green clay at the sub-Cretaceous unconformity in northeastern Alberta occurs locally in areas of karst (see Hein et al., in press). It is not known whether the green clay is related to a regolith developed at the unconformity, decalcified calc-shale, fault gauge, or low temperature exhalative clays such as nontronite. Sulfide nodules occur *in situ* at RE99-74E-96 along vertical fractures in the McMurray Formation (Figure 7) which generally parallel the main trend of the faulting.

Sulfides are also observed in several cores and are associated with karst-features at the sub-Cretaceous unconformity. For example, the contact between the Devonian Waterways Formation and overlying Cretaceous McMurray Formation oil sands in well AOSRD UTF LD-9 (samples RE-NE96-32-001, -002, and –003) is comprised of slump features and fractures that are accompanied by finely disseminated to massive pyrite (Figure 8).

5. GEOCHEMICAL RESULTS

Sample site descriptions and geochemical data from analysis of bedrock, stream sediment and stream sediment HMC are presented in the following appendices
Appendix 1a - 1996 bedrock sample geochemistry;
Appendix 1b - 1996 and 1997 core sample geochemistry;
Appendix 2 - 1999 bedrock sample geochemistry;
Appendix 3a - 1999 stream sediment sample site descriptions;
Appendix 3b - 1999 stream sediment sample geochemistry;
Appendix 4a - 1999 stream sediment HMC sample site descriptions; and
Appendix 4b - 1999 stream sediment HMC sample geochemistry.

With the exception of sample sites from sections with karst deformation, the samples collected during 1996, 1997 and 1999 generally contain low or background metal concentrations. The following summarizes geochemical highlights from 1996 bedrock and core, 1997 bedrock to 1999 bedrock, stream silt sediment and stream sediment HMC samples.

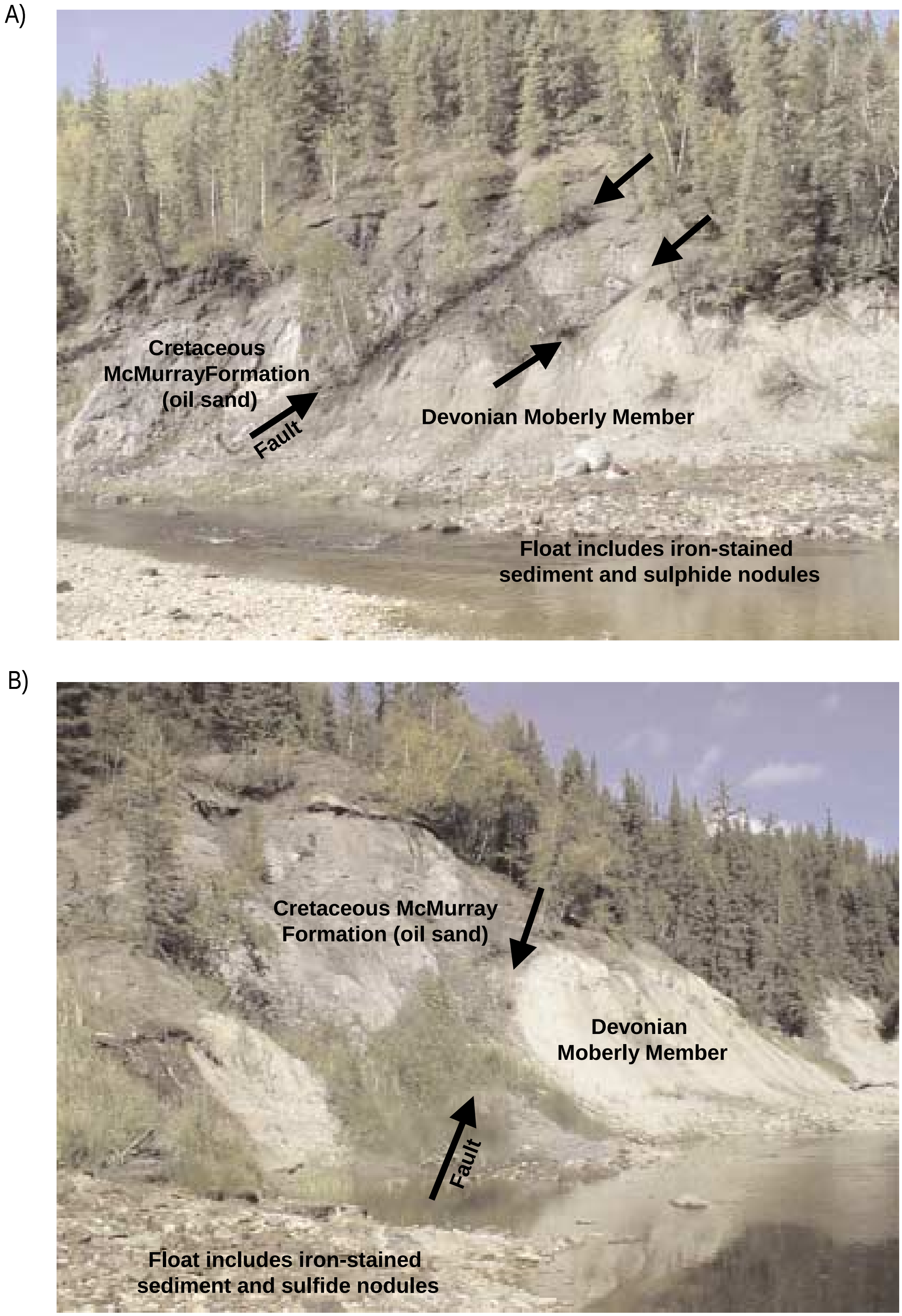

Figure 5. Faulted Devonian (Moberly Member) and Cretaceous (McMurray Formation) rocks along the McKay River. The sections occur side-by-side: A) left and B) right, with rusty-weathered detritus in the middle.

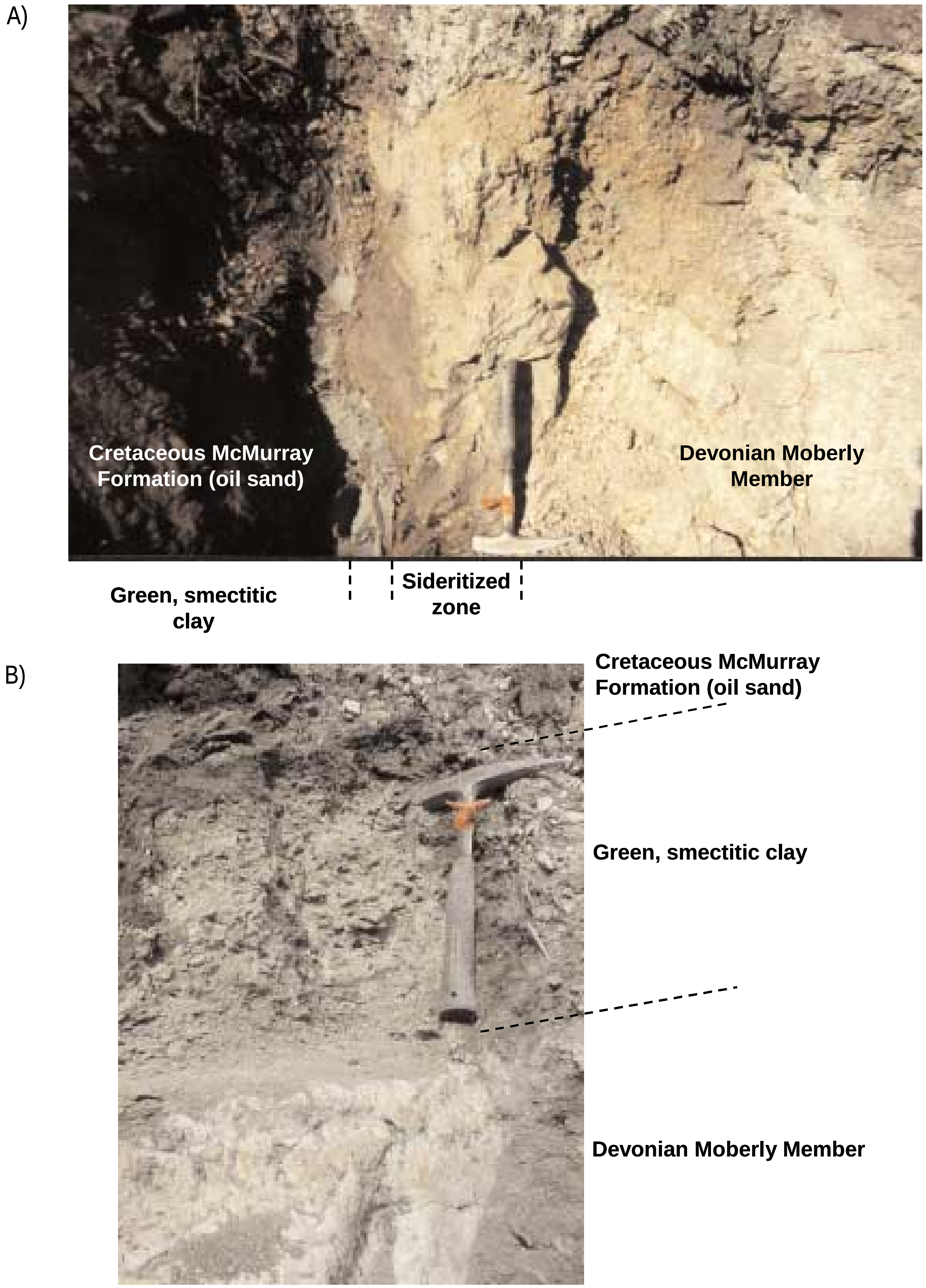

Figure 6. Green smectitic clay at the sub-Cretaceous unconformity along the McKay River. The clay is associated with a sideritized, altered rock at the sub-Cretaceous unconformity (A), and sometimes forms a distinct layer between the underlying carbonates and overlying oil sands (B).

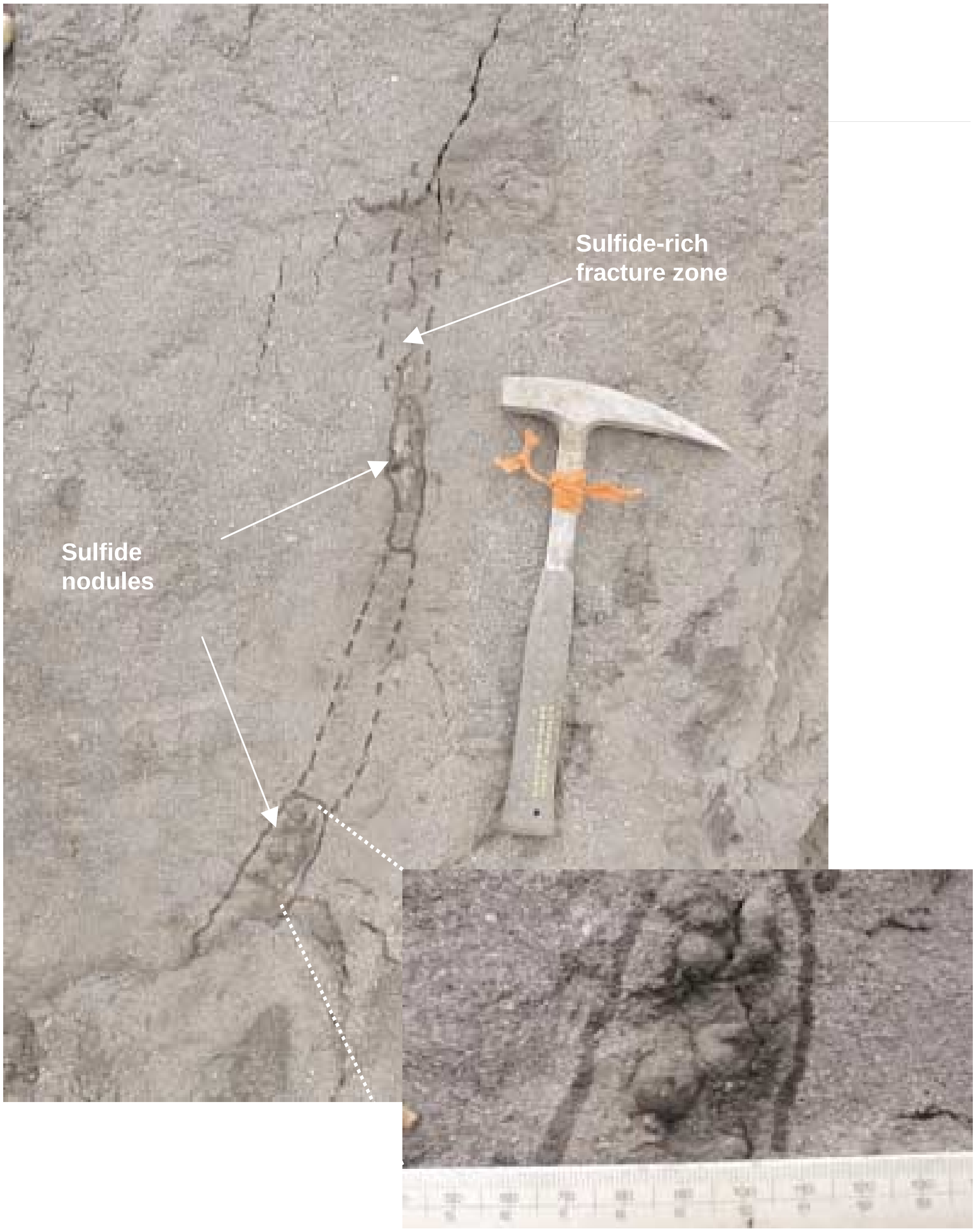

Figure 7. The occurrence of in situ sulfide nodules along fractures at a section along the McKay River.

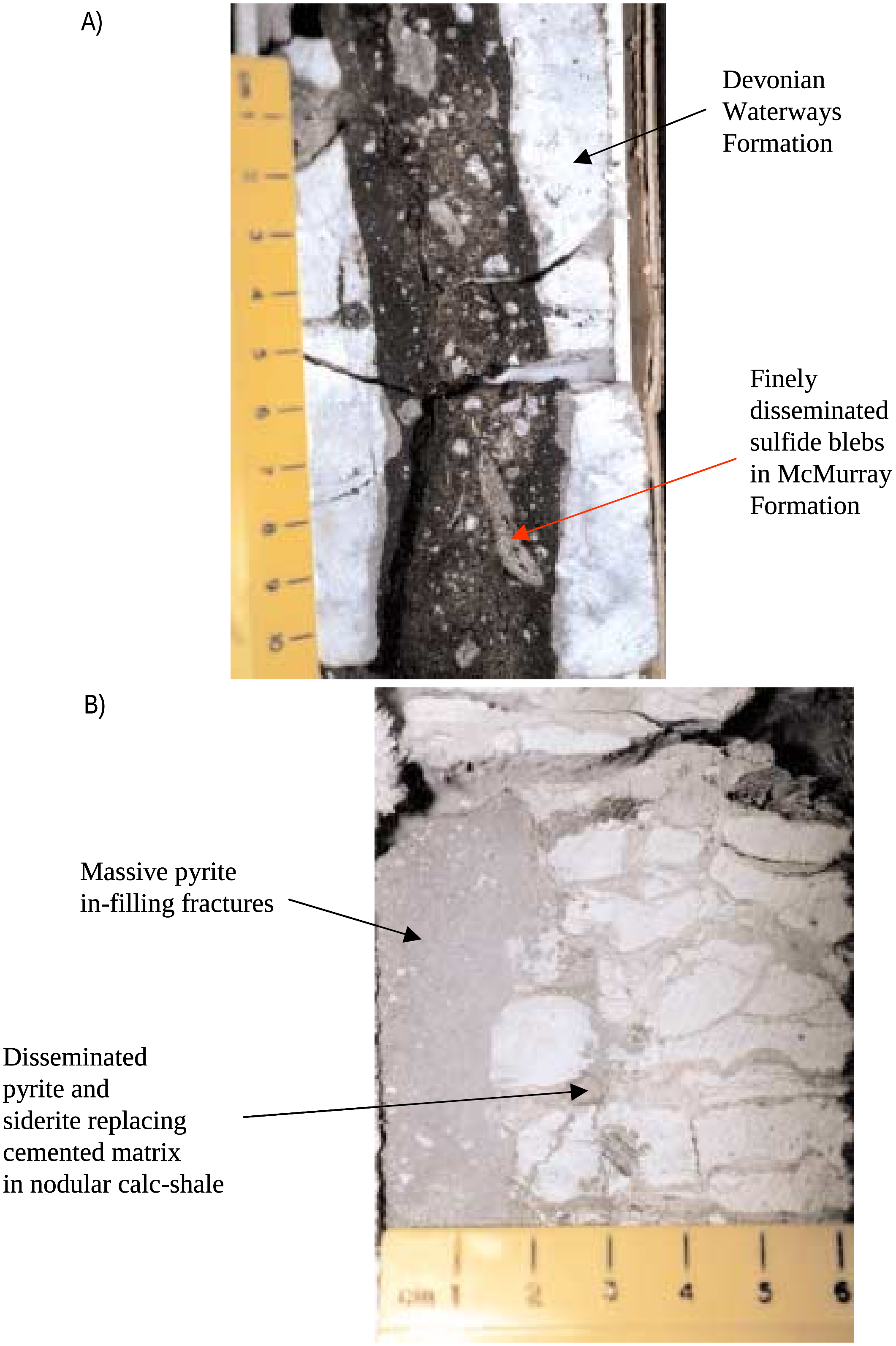

Figure 8. Disseminated and massive sulfides in a karsted section of core at the sub-Cretaceous unconformity. A) pyrite blebs in McMurray Formation oil sands; (RE-NE96-32-001 and -002); B) massive pyrite in-filling fractures and cement in nodular calc-shale (RE-NE96-32-003).

1996 Bedrock

Sample RE-NE96-06-003, which is from the Christina River approximately 25 km east of Fort McMurray, contains 1,342 ppm Zn with 37.4% Fe, 1.5 ppm Sb, 98 ppm Ni, and 342 ppm V. For comparison, the next highest zinc value from bedrock samples analyzed during 1996 was 231 ppm Zn from sample RE-NE96-10-004, which also contains 100 ppm As, 1,200 ppm Ba, 62 ppm Co, 107 ppm Ni, and 6,354 ppm Mn. The Christina River section (RE-NE96-06) is characterized by karsting at the sub-Cretaceous unconformity. Here, the deformed Christina Member (Waterways Formation) is highly altered (sideritized) and overlain by a green rind- or regolith-like clay (sample RE-NE96-06-003) that separates the Christina Member from the overlying basal McMurray Formation. Three samples of altered Christina Member, located directly below the green clay, contained high iron (between 34.6 and 40.2% Fe). However, 1996 samples of the Christina Member and basal McMurray Formation did not contain any elevated concentrations of Fe, Zn, Ni, and V in comparison to values derived from the green clay.

1996 and 1997 Subsurface Core

The few 1996 and 1997 subsurface core samples did include a single sample with high Ni and Cr values from well AL-1, located approximately 17.5 km northeast of Fort McKay. A sample from this well was comprised of quartz- and K-feldspar-rich granite from the crystalline basement (sample RE-NE96-29-004) and contains 1170 ppm Ni with 1,700 ppm Cr, 54 ppm Cu, 101 ppm Zn, and 4 ppb Au. However, this basement sample was collected at a depth of between 307.4 and 308.5 m. Core samples with disseminated to massive pyrite (Figure 8) contain low base metal concentrations, and only background precious metal values.

1999 Bedrock, Stream Sediment and Stream Sediment HMC

The maximum concentrations for selected metals from bedrock samples which were collected and analyzed during 1999, include 105 ppm Cr (RE99-74E-96-05), 126 ppm Ni (RE99-74E-96-29), 139 ppm Zn and 139 ppm V (RE99-74E-99-005). Maximum precious metal contents include 10 ppb Au (RE99-74E-35-004) and 13 ppb Pd (RE99-74E-97-003). As for the 1996 bedrock sample set, the 1999 samples that contain slightly elevated concentrations of metals were derived from the green clay layer between karsted Devonian carbonates and Cretaceous sandstones. Six sulfide nodule samples (RE99-74E-35-003, RE99-74E-85-008, RE99-74E-85-009, RE99-74E-96-017, RE99-74E-96-026, and RE99-74E-99-003) contain lower metal values than green clay samples. The maximum values for selected metals from the sulfide nodules include 0.6 ppm Sb, 4 ppm Se, 21 ppm Ni, 19.37% S and 8 ppb Au from sample RE99-74E-35-003, and 31.7 ppm As and 51 ppm Zn from sample RE99-74E-99-003.

Given the relatively poor trace metal results from analysis of bedrock in the Bitumount area, the stream sediment samples yielded surprisingly higher results. For example, sample RE99-74E-51-002 contains very low overall trace elements, with the exception of gold, which assays 32 ppb by INAA (but only 3 ppb Au by fire assay). This result has to be duplicated and highlights the need for a rigorous stream sediment orientation survey in the vicinity of known mineralization in northern Alberta. Other interesting stream sediment results include sample RE99-74E-46-002, which assays 13 ppb Au (fire assay), 43 ppm Ni, and 136 ppm Zn, and sample RE99-74E-23-002, which contains the highest suite of metals recovered from the stream sediment survey (22.8 ppm As, 1500 pm Ba, 13 ppm Co, 87 ppm Cr, 5 ppm Mo, 10.5 ppm Th, 4.2 ppm U, 128 ppm Zn, 38 ppm Ni and 197 ppm V). The diverse range in elevated trace elements from the latter suggest this sample site may be regarded as the only bonafide anomaly in this stream sediment data set.

Stream sediment HMC samples were picked for diamond indicator minerals by the SRC. No definite or possible silicate grains (garnet, clinopyroxene, orthopyroxene, and olivine) and minimal (no definite and typically <6 possible) oxide grains (chromite and ilmenite) were reported. No grains were microprobed due to the poor picking results and budget limitations of this project.

6. ORIGIN OF SULFIDE AND CLAY MINERALS

X-ray diffraction, petrography, sulfur isotopes and Scanning Electron Microprobe (SEM) were used to examine samples in the immediate vicinity of karst or fault structures for the detection of any hydrothermal phenomena and to interpret the origin of the sulfide and clay minerals. The quantitative results of the x-ray diffraction and sulfur isotope analysis are presented in Table 1. Descriptive microscopic texture and mineralogy are presented in Appendix 5.

The only sulfides detected in the samples were pyrite and marcasite. There was some confusion as to whether a mineral identified optically was arsenopyrite. However, Energy Dispersive Spectra (EDS) on the SEM did not detect any arsenic in the mineral in question, only sulfur and iron. Therefore, it can be concluded that the mineral in question was in fact, marcasite. The sulfide nodules are comprised of pyrite in the inner core and marcasite inter-grown with pyrite on the rims (Figure 9a, b). No traces of higher temperature sulfides such as pyrrhotite or arsenopyrite were detected.

Pyrite and marcasite in the samples are interpreted to been have formed by the replacement of ferruginеous carbonate cement. Such replacements combined with formation of nodular structures (RE99-74E-85-008, RE99-74E-85-010, RE99-74E-95-003, RE99-74E-96-026, and RE99-74E-99-003) might occur in a low temperature, deep-sea, anaerobic environment. The replacement most likely was two-staged: 1) carbonates replaced by cryptocrystalline, black-powdered melnikovite, and later, 2) melnikovite recrystallized to marcasite or pyrite (Figure 9c, d). Marcasite, being crystallized from melnikovite, indicates either a low temperature sedimentary origin, or precipitation from low-temperature hydrothermal brine. Quartz grains from sample RE99-74E-96-014 may support the latter theory, as some grains contain uncommon solid rutile inclusions. In addition, sample RE99-74E-96-REF2 includes ‘suspect’ secondary quartz that might be of low temperature hydrothermal origin. One quartz grain from this sample contains fluid inclusions with gas bubbles, suggesting temperature of crystallization might be determined by fluid inclusion analysis.

Arehart (1996) documented iron sulfides from sediment-hosted disseminated gold deposits as having extreme variability in their elemental and isotope zoning ($\delta\ ^{34}$S values from -30 to +20‰). He analyzed sulfides from the Post/Betze deposit, Nevada and recognized distinct $\delta\ ^{34}$S compositions: -5 to +10‰ for pre-ore pyrite (igneous and sedimentary); up to +20‰ for main ore-bearing pyrite; and ^{34}S-depleted values of –15 to –30‰ for post-ore pyrite (gold-poor and arsenic-rich late stage hydrothermal fluids). Delta^{34}S values of between +8.7 and +25.0‰ were derived from seven sulfide nodule samples collected during 1999 and suggest a complicated relationship for sulfide formation in the Bitumount area. The heavy $\delta\ ^{34}$S values suggest the most likely source of sulfur was from sedimentary sulfates ($\delta\ ^{34}$S of +20 to +35‰), rather than igneous or sedimentary sulfides ($\delta\ ^{34}$S of –5 to +10‰).

Smectite group clay minerals were petrographically identified in samples RE99-74E-96-005, RE99-74E-96-006, RE99-74E-96-014, RE99-74E-96-015 and RE99-74E-99-004. X-ray diffraction of the green clay at its best exposure (sample site RE99-74E-96), showed its clay (<2 um) composition to be 90 vol. % illite and 10 vol. % kaolinite. Kaolinite, illite and smectite have been documented in different environments. For example: 1) clay diagenesis with depth of burial, involving mainly illite-to-smectite tran-

Table 1. Sulfur isotope and x-ray diffraction analysis from selected samples at the sub-Cretaceous unconformity.

Sample ID		Sulfur Isotope delta^{34}S$_{total}$	X-ray diffraction Clay (<2um)	X-ray diffraction Bulk (<120um)
RE99-74E-35-003a	Float: sulphide nodules	10.7	N/A	N/A
RE99-74E-35-003b	Float: sulphide nodules	8.7	N/A	N/A
RE99-74E-85-005	Fe-stained, silicified, dark grey siltstone with pyrite and marcasite (up to 10%)	11.9	25% illite; 75% kaolinite	quartz; siderite; marcasite
RE99-74E-85-006	Fe- and C-rich siltstone with abundant sulphide nodules	14.4	no evidence of clays	quartz; pyrite
RE99-74E-85-007	McMurray oil sands directly below 006	N/A	50% illite; 50% kaolinite	quartz
RE99-74E-85-008	single in situ sulphide nodule	8.8	no evidence of clays	quartz; siderite; marcasite
RE99-74E-85-009	sulphide nodule with asicular gypsum(?) needles	10.6	40% illite; 60% kaolinite	quartz; siderite; marcasite
RE99-74E-85-010	carbon-rich siltstone layers with sulphide	N/A	50% illite; 50% kaolinite	quartz; siderite; marcasite
RE99-74E-96-001	rusty, nodular, calcareous Moberly	-10.0	N/A	N/A
RE99-74E-96-002	sideritized, more massive Moberly (directly beneath contact)	N/A	90% illite; 10% kaolinite	quartz; calcite
RE99-74E-96-003	Green clay regolith at unconformity	4.5	90% illite; 10% kaolinite	quartz; calcite; clay (illite)
RE99-74E-96-004	Extremely sideritized, carbonate; broken outcrop	0.3	70% illite; 30% kaolinite	quartz; siderite
RE99-74E-96-005	smectitic clay (possible bentonite)	12.5	90% illite; 10% kaolinite	quartz; clay (illite and kaolinite)
RE99-74E-96-006	smectitic clay (bentonite)	N/A	90% illite; 10% kaolinite	quartz; clay (illite and kaolinite)
RE99-74E-96-019	pink clay-silt unit that marks break between basal McMurray and oil sands	N/A	95% kaolinite; 5% chlorite	quartz; clay (kaolinite)
RE99-74E-96-024	pink, bentonitic material at unconformity	9.9	15% illite; 85% kaolinite	quartz; clay (kaolinite)
RE99-74E-96-026	Sulphide nodules from gravel bar	25.0	100% kaolinite	quartz; pyrite
RE99-74E-96-029	green clay right at shear contact	21.5	90 % illite; 10% kaolinite	quartz; clay (illite and kaolinite)
RE99-74E-96-030	green clay located directly below fault contact in calc-shale	N/A	90% illite; 10% kaolinite	quartz; clay (illite and kaolinite)
RE99-74E-96-REF1	sideritized, sulphide-rich concretion right at shear contact	N/A	70% illite; 30% kaolinite	quartz; siderite
RE99-74E-96-REF2	sideritized, sulphide-rich concretion right at shear contact	N/A	35% illite; 65% kaolinite	quartz; siderite
RE99-74E-96-REF3	Basal McMurray Fm.; bitumen-stained, coarse-grained sandstone	N/A	100% kaolinite	quartz; clay (kaolinite)
RE99-74E-99-002	Float: highly altered McMurray Formation	N/A	100% kaolinite	quartz; siderite; clay (kaolinite)
RE99-74E-99-003	Float: sulphide nodules	21.6	no evidence of clays	quartz; pyrite
RE99-74E-99-004	Float: highly altered siderite with botryoidal goethite	59.8	90% illite; 10% kaolinite	quartz; goethite; lepidocrocite
RE99-74E-99-005	Float: green clay	N/A	100% kaolinite	quartz; clay (kaolinite)
	N/A - Not analyzed			

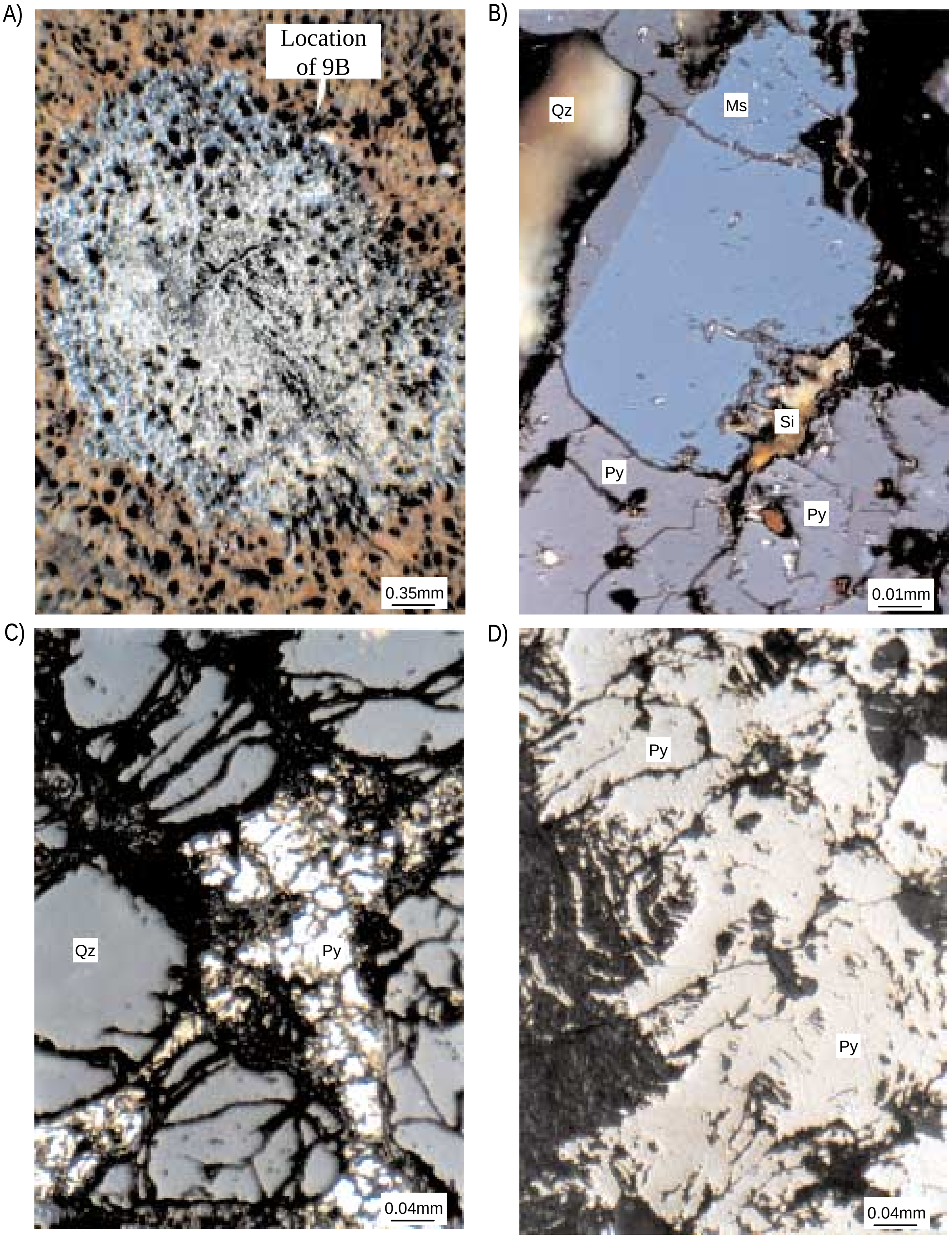

Figure 9. Photomicrographs of selected sulfides. A) sulfide nodule with pyrite core and marcasite intergrown with pyrite rim (RE99-74E-95-003); B) a grain of marcasite is intergrown with pyrite (see 9A for location); C) initial recrystallization of melnikovite (black powder bordering clastic grains) to pyrite (RE99-74E-96-026); D) pyrite replacing melnikovite (RE99-74E-85-010). All pictures, except A, taken with a Epiplan 40x oil lens. Abbreviations: Ms - marcasite; Py - pyrite; Qz - quartz; Si siderite.

sition and becoming active when overburden exceeds 2 km thickness (e.g., Mexico Gulf Coast); 2) present-day association of green Fe-rich clay minerals such as nontronite, celadonite and glauconite, with low-temperature hydrothermal systems generated by marine basaltic volcanism (e.g., Galapagos spreading center); and 3) the formation of kaolinite, illite and/or chlorite in sandstone submitted to fluid migrations (e.g., North Sea).

A recent petrogenesis study of the Athabasca Basin by Kotzer and Kyser (1995) concluded that major sandstone aquifers have been affected by widespread lateral flow of diagenetic fluids over distances of hundreds of kilometres and that these fluid migration paths have been modified by cross-formational fluid flow near active fault zones. Furthermore, they suggested that mixing of two isotopically-distinct fluids in the vicinity of faults was the process by which uranium was precipitated. The presence of metal-enriched green clay in the vicinity of karsted and faulted sections in the Bitumount area could have developed under similar conditions. It is possible that deep brines flowing along the Contact Rapids unconformity propagate upwards via structural pathways through the Winnipegosis Formation and deposited metals within the reducing green clay layer. No conclusion regarding a diagenetic or hydrothermal influence or clay mineral generation was reached in this study.

7. CONCLUSIONS

Disseminated and massive sulfides occur in association with karst or fault structures at the sub-Cretaceous unconformity in the Fort McMurray area. Competent, concretionary layers of sideritized and possibly silicified McMurray Formation contain up to 10 vol. % disseminated pyrite and marcasite. Sulfide nodules are located ‘in situ’ and form preferentially along carbon-rich layers and fractures. Nodular sulfides occur as a result of replacement of ferrugineous carbonate cement and are characterized by pyrite inner cores with pyrite and marcasite rims. The formation of these nodules, in addition to marcasite being crystallized from melnikovite is believed to be indicative of either a low temperature sedimentary origin, or from precipitation from low-temperature hydrothermal brine solutions.

With the exception of a green clay layer, bedrock metal concentrations are generally low to locally high background for a few elements. The green clay layer, which is typically located in karsted sections and separates the Devonian Waterways Formation from the overlying McMurray Formation, contains the highest concentration of metals from samples collected between 1996 and 1999. The highest results from a sample of the green clay (RE-NE96-06-003, Christina River) contain 1,342 ppm Zn with 37.4% Fe, 1.5 ppm Sb, 98 ppm Ni, 342 ppm V and 4 ppb Au. Other metal concentrations from the green clay unit include up to 105 ppm Cr (RE99-74E-96-05), 126 ppm Ni (RE99-74E-96-29), 139 ppm Zn and 139 ppm V (RE99-74E-99-005); maximum precious metal contents include 10 ppb Au (RE99-74E-35-004) and 13 ppb Pd (RE99-74E-97-003).

The limited dataset and general lack of metallic mineral occurrences make it difficult to either credit or discredit the Prairie-type mineralization model. There is no doubt that mineralization does occur in a low-temperature regime where reducing conditions locally prevail in structurally controlled settings as well as regionally, at major stratigraphic boundaries. On the basis of the present examination, ambiguities still remain concerning the hydrothermal versus diagenetic origin of both sulfides and the green clay. It is possible that deep brines flowing along the Contact Rapids unconformity propagate upwards via structural pathways through the Winnipegosis Formation. Further isotope analysis and selected other studies to delineate the possible relationship between the areas of karst and basement structures are recommended for future research.

With respect to possible gold and other precious metal concentrations, the authors recommend a detailed quantitative ion microprobe analysis should be conducted. Such a study may help to build on current theories of the abundance and distribution of ultra-fine gold (e.g., Xueqiu et al., 1995; Hanlie et al., 1999).

Appendix 1a. 1996 Bedrock Sample Geochemisty

Appendix 1a. 1996 bedrock sample geochemistry.

				Analysis by Activation Laboratories LTD--(Report 12405)--INAA																																				Analysis by Activation Laboratories LTD--Report 12405B--Total Digestion/Fire Assay ICP																				Rep 12405C C,S-LECO			
Sample Number	Easting	Northing	General rock description or formation	AU PPB	AG PPM	AS PPM	BA PPM	BR PPM	CA %	CO PPM	CR PPM	CS PPM	FE %	HF PPM	HG PPM	IR PPB	MO PPM	NA %	NI PPM	RB PPM	SB PPM	SC PPM	SE PPM	SN %	SR %	TA PPM	TH PPM	U PPM	W PPM	ZN PPM	LA PPM	CE PPM	ND PPM	SM PPM	EU PPM	TB PPM	YB PPM	LU PPM	Mass g	MO PPM	CU PPM	PB PPM	ZN PPM	AG PPM	NI PPM	MN PPM	SR PPM	CD PPM	BI PPM	V PPM	CA %	P %	MG %	TI %	AL %	K %	Y PPM	BE PPM	AU PPB	PT PPB	PD PPB	C %	S %
			Detection limit -->	2	5	0.5	50	0.5	1	1	5	1	0.01	1	1	5	1	0.01	20	15	0.1	0.1	3	0.01	0.05	0.5	0.2	0.5	1	50	0.5	3	5	0.1	0.2	0.5	0.2	0.05	0	2	1	5	1	0.4	1	1	1	0.5	5	2	0.01	0	0.01	0.01	0.01	0.01	2	2	0	0	0	0.01	0.01
RE-NE96-01-001	462470	6331072	Beaver River Fm.	-2	-5	1	68	-0.5	-1	-1	24	-1	0.07	19	-1	-5	5	0.01	28	-15	0.5	3.5	-3	-0.01	-0.05	2.5	9	3.5	4	-50	8.1	18	5	1.2	0.4	0.5	3.3	0.58	37.97	3	10	14	3	-0.4	3	22	12	0.5	-5	25	0.05	0.004	0.01	0.61	0.62	0.01	10	-2	-2	-5	-4	0.394	0.037
RE-NE96-02-001	464247	6333540	McMurray oil sands	3	-5	0.9	55	1.1	-1	-1	25	-1	0.09	15	-1	-5	4	0.02	-20	-15	0.5	3.7	4	-0.01	-0.05	2.3	5.6	3.8	3	-50	13	18	6	1.3	0.5	-0.5	3	0.5	45.26	3	9	21	3	-0.4	5	25	41	-0.5	-5	34	0.08	0.013	0.01	0.77	0.28	0.01	8	-2	-2	-5	-4	1.43	0.079
RE-NE96-08-007	461688	6368207	McMurray oil sands	2	-5	1.5	320	0.6	-1	2	37	2	1.04	14	-1	-5	4	0.05	-20	29	0.3	3.7	-3	-0.01	-0.05	1.1	8	2.7	-1	-50	23	46	16	3	0.8	0.5	2.7	0.46	37.42	-2	11	9	14	-0.4	8	45	44	-0.5	-5	37	0.05	0.008	0.11	0.32	3.21	0.87	10	-2	-2	-5	-4	1.40	0.641
RE-NE96-10-007	454615	6336700	McMurray oil sands	-2	-5	2.7	410	-0.5	-1	12	63	4	1.03	10	-1	-5	2	0.11	-20	66	0.4	6.8	-3	-0.01	-0.05	1.1	9.9	2.6	-1	72	28	63	24	4.1	0.9	0.7	2.9	0.46	31.18	-2	19	20	56	-0.4	32	138	76	-0.5	-5	72	0.11	0.016	0.32	0.4	5.94	1.32	13	-2	-2	-5	-4	2.81	0.192
RE-NE96-10-008	454615	6336700	McMurray oil sands	2	-5	4.3	280	-0.5	3	6	45	-1	3.46	40	-1	-5	4	0.05	50	20	0.2	4	-3	-0.01	-0.05	1.2	26	5.2	-1	62	63	130	44	8.5	1.2	0.9	4.9	0.83	43.99	-2	10	21	78	-0.4	10	957	94	-0.5	-5	30	4.06	0.037	0.15	0.28	1.81	0.54	22	-2	4	-5	-4	2.15	0.326
RE-NE96-14-003	475768	6287435	McMurray oil sands	-2	-5	1.4	380	-0.5	-1	2	18	-1	0.24	13	-1	-5	-1	0.05	-20	27	0.2	2.6	-3	-0.01	-0.05	0.7	8.1	1.9	-1	82	21	44	20	2.9	0.6	-0.5	2	0.36	43.55	-2	8	16	92	-0.4	9	89	48	0.5	-5	15	0.06	0.008	0.06	0.26	1.68	0.92	11	-2	-2	-5	-4	0.422	0.053
RE-NE96-16-004	475066	6297846	McMurray oil sands	-2	-5	0.9	200	-0.5	-1	1	9	-1	0.25	4	-1	-5	-1	0.03	-20	-15	0.1	1	-3	-0.01	-0.05	-0.5	2.8	0.9	-1	-50	8	16	7	1.1	0.3	-0.5	0.8	0.12	43.14	-2	7	13	9	-0.4	3	106	30	-0.5	-5	10	0.06	0.005	0.02	0.13	0.94	0.54	6	-2	-2	-5	-4	0.264	0.034
RE-NE96-22-002	463115	6342616	McMurray oil sands	-2	-5	-0.5	50	-0.5	-1	-1	17	-1	0.17	6	-1	-5	1	0.02	-20	-15	-0.1	1.6	-3	-0.01	-0.05	0.6	3.4	1	-1	-50	6.6	13	6	0.8	0.2	-0.5	0.7	0.12	41.82	-2	5	9	4	-0.4	5	26	11	-0.5	-5	20	0.06	0.003	0.03	0.14	1.06	0.07	2	-2	-2	-5	-4	0.728	0.136
RE-NE96-22-003	463115	6342616	McMurray oil sands	-2	-5	1.2	350	-0.5	2	4	27	-1	16.1	8	-1	-5	-1	0.07	-20	-15	-0.1	11	-3	-0.01	-0.05	-0.5	3.9	1.6	-1	54	16	34	10	2.7	0.7	0.7	2.7	0.46	40.54	-2	11	4	20	-0.4	6	2798	99	-0.5	-5	44	2.18	0.06	1.72	0.1	1.15	0.38	25	7	-2	-5	-4	5.98	0.116
RE-NE96-22-004	463115	6342616	McMurray oil sands	-2	-5	-0.5	-50	-0.5	-1	-1	8	-1	0.11	4	-1	-5	1	0.02	-20	-15	-0.1	0.8	-3	-0.01	-0.05	-0.5	2.1	0.5	-1	-50	4.4	9	-5	0.5	-0.2	-0.5	0.5	0.08	43.24	-2	6	6	3	-0.4	2	23	9	-0.5	-5	5	0.02	0.002	0.01	0.08	0.2	0.03	2	-2	-2	-5	-4	0.121	0.038
RE-NE96-23-001	460012	6339034	McMurray oil sands	-2	-5	1.4	290	-0.5	-1	-1	18	-1	0.16	16	-1	-5	-1	0.04	-20	19	0.1	1.7	-3	-0.01	-0.05	0.7	7.2	2	-1	-50	21	45	19	2.9	0.6	-0.5	1.9	0.32	41.9	-2	7	12	7	-0.4	2	43	37	-0.5	-5	11	0.02	0.006	0.02	0.24	0.89	0.62	8	-2	-2	-5	-4	0.212	0.030

				Analysis by Activation Laboratories LTD--(Report 12014)--INAA																																				Analysis by Activation Laboratories LTD--Report 12014B--Total Digestion/Fire Assay ICP																				Rep 12014C C,S-LECO			
Sample Number	Easting	Northing	General rock description or formation	AU PPB	AG PPM	AS PPM	BA PPM	BR PPM	CA %	CO PPM	CR PPM	CS PPM	FE %	HF PPM	HG PPM	IR PPB	MO PPM	NA %	NI PPM	RB PPM	SB PPM	SC PPM	SE PPM	SN %	SR %	TA PPM	TH PPM	U PPM	W PPM	ZN PPM	LA PPM	CE PPM	ND PPM	SM PPM	EU PPM	TB PPM	YB PPM	LU PPM	Mass g	MO PPM	CU PPM	PB PPM	ZN PPM	AG PPM	NI PPM	MN PPM	SR PPM	CD PPM	BI PPM	V PPM	CA %	P %	MG %	TI %	AL %	K %	Y PPM	BE PPM	AU PPB	PT PPB	PD PPB	C %	S %
			Detection limit -->	2	5	0.5	50	0.5	1	1	5	1	0.01	1	1	5	1	0.01	20	15	0.1	0.1	3	0.01	0.05	0.5	0.2	0.5	1	50	0.5	3	5	0.1	0.2	0.5	0.2	0.05	0	2	1	5	1	0.4	1	1	1	0.5	5	2	0.01	0	0.01	0.01	0.01	0.01	2	2	0	0	0	0.01	0.01
RE-NE96-01-002	462470	6331072	Organic-rich McMurray Fm.	6	-5	-0.5	-50	-0.5	-1	1	60	-1	0.15	25	-1	-5	7	0.02	-29	-15	0.7	11	-3	-0.01	-0.05	5.2	23	4.6	-1	-50	35	69	30	5	1.3	-0.5	7.1	1.05	26.33	3	12	49	3	0.4	4	45	23	-0.5	-5	35	0.5	0.007	0.02	0.94	0.45	0.01	19	-2	-2	-5	-4	7.29	0.037
RE-NE96-01-003	462470	6331072	Beaver River Fm. Sandstone	-2	-5	-0.5	-50	-0.5	-1	-1	9	-1	0.18	20	-1	-5	2	0.02	-20	-15	0.3	2.7	-3	-0.01	-0.05	0.9	2.5	2.6	-1	-50	2.5	9	-5	0.6	0.3	-0.5	3	0.46	30.88	-2	6	4	5	-0.4	6	30	3	-0.5	-5	11	0.05	0.002	0.01	0.38	0.09	0.01	4	-2	-2	-5	-4	0.889	0.082
RE-NE96-02-002	464247	6333540	Beaver River Fm. Sandstone	-2	-5	-0.5	-50	-0.5	-1	-1	-5	-1	0.06	10	-1	-5	-1	0.01	-20	-15	0.4	0.7	-3	-0.01	-0.05	-0.5	0.7	1	-1	-50	0.6	-3	-5	0.2	-0.2	-0.5	0.8	0.11	35.64	-2	3	4	2	-0.4	6	16	2	-0.5	-5	10	0.02	0.002	0.01	0.1	0.04	0.01	2	-2	-2	-5	-4	2.63	0.173
RE-NE96-03-001	464172	6334654	Moberley Memb.	-2	-5	1.1	-50	2.5	34	3	20	2	1.03	-1	-1	-5	-1	0.04	-22	27	0.2	3.3	-3	-0.01	-0.05	-0.5	1.7	-0.5	-1	-50	7.2	19	7	1.1	0.4	-0.5	0.6	0.1	25.15	-2	7	4	14	-0.4	9	211	363	-0.5	-5	18	33.94	0.018	1.74	0.06	1.32	0.61	5	-2	-2	-5	-4	11.4	0.020
RE-NE96-03-002	464172	6334654	Moberley Memb.	-2	-5	-0.5	120	3.3	39	3	16	2	1.01	-1	1	-5	-1	0.04	-22	34	-0.1	3.2	-3	-0.01	0.05	-0.5	2.5	-0.5	-1	-50	6.9	17	6	1.2	0.2	-0.5	0.5	0.08	26.02	-2	6	4	13	-0.4	10	213	355	-0.5	-5	17	36.18	0.017	1.61	0.08	1.2	0.56	6	-2	-2	-5	-4	11.6	0.019
RE-NE96-03-003	464172	6334654	Moberley Memb.	-2	-5	0.8	130	3.4	40	2	18	1	1.03	-1	-1	-5	-1	0.04	-20	-15	-0.1	3.4	-3	-0.01	-0.05	-0.5	2.1	-0.5	-1	-50	6.9	14	7	1.1	0.3	-0.5	0.5	0.08	27.29	-2	6	4	12	-0.4	11	195	318	-0.5	-5	17	35.16	0.016	1.25	0.05	1.24	0.58	5	-2	-2	-5	-4	11.3	0.019
RE-NE96-03-004	464172	6334654	Moberley Memb.	-2	-5	-0.5	160	2.9	33	3	18	-1	1.06	-1	-1	-5	-1	0.04	-22	31	-0.1	3.3	-3	-0.01	-0.05	-0.5	2.1	-0.5	-1	-50	7.2	15	-5	1.1	0.4	-0.5	0.4	0.06	26.23	-2	6	5	14	-0.4	12	239	291	-0.5	-5	18	36.14	0.015	1.11	0.06	1.33	0.61	6	-2	-2	-5	-4	11.5	0.022
RE-NE96-03-005	464172	6334654	Moberley Memb.	-2	-5	1.1	170	3.4	37	3	20	1	1.01	-1	-1	-5	-1	0.04	-22	-15	-0.1	3.4	-3	-0.01	-0.05	-0.5	2.2	-0.5	-1	-50	7.6	15	-5	1.2	0.4	-0.5	0.6	0.1	24.12	-2	6	4	15	-0.4	8	234	246	-0.5	-5	17	35.83	0.012	0.74	0.05	1.34	0.6	6	-2	-2	-5	-4	11.0	0.014
RE-NE96-03-006	464172	6334654	Moberley Memb.	-2	-5	7.3	-50	4.7	43	6	16	1	1.07	-1	-1	-5	-1	0.04	-22	31	0.3	3.3	-3	-0.01	-0.05	-0.5	1.5	-0.5	-1	-50	8.4	19	7	1.6	0.4	-0.5	0.8	0.12	24.57	-2	9	7	11	-0.4	12	245	225	-0.5	-5	17	37.33	0.014	0.63	0.05	1.11	0.49	7	-2	-2	-5	-4	11.3	0.047
RE-NE96-03-007	464172	6334654	Moberley Memb.	-2	-5	2.1	350	-0.5	20	10	56	3	2.17	4	-1	-5	-1	0.06	70	63	-0.1	9	-3	-0.01	-0.05	-0.5	7.7	2.6	-1	-50	22	49	17	3.5	0.9	0.8	2.3	0.34	25	-2	13	5	44	-0.4	25	345	175	-0.5	-5	53	17.82	0.054	1.18	0.21	3.64	1.66	13	-2	-2	-5	-4	5.55	0.028
RE-NE96-03-008	464172	6334654	Moberley Memb.	-2	-5	-0.5	210	3.2	27	7	52	3	2.22	3	-1	-5	-1	0.06	-30	60	0.2	8	-3	-0.01	-0.05	-0.5	6.3	2.3	-1	100	19	39	16	3.1	0.7	-0.5	1.9	0.29	22.72	-2	9	4	27	-0.4	19	405	174	-0.5	-5	40	22.5	0.041	0.84	0.15	2.8	1.22	11	-2	-2	-5	-4	7.27	0.021
RE-NE96-03-009	464172	6334654	Moberley Memb.	-2	-5	2.4	200	3	25	8	54	3	3.79	4	-1	-5	2	0.06	-24	68	-0.1	7.8	-3	-0.01	-0.05	-0.5	5.9	1.7	-1	-50	19	38	15	3.2	0.8	-0.5	1.8	0.28	23.26	-2	11	6	38	-0.4	20	665	162	-0.5	-5	40	20.74	0.044	0.74	0.15	2.78	1.24	11	-2	-2	-5	-4	6.87	0.025
RE-NE96-03-010	464172	6334654	Moberley Memb.	3	-5	2.2	220	4.6	38	4	27	2	1.22	2	-1	-5	-1	0.04	-20	37	-0.1	4.5	-3	-0.01	-0.05	-0.5	3.2	1.1	-1	-50	11	20	8	1.8	0.5	-0.5	1	0.15	26.34	-2	7	5	16	-0.4	12	240	206	-0.5	-5	23	31.99	0.017	0.65	0.09	1.7	0.73	7	-2	-2	-5	-4	10.1	0.022
RE-NE96-03-011	464172	6334654	Moberley Memb.	-2	-5	1.4	71	3.5	45	1	7	-1	0.78	-1	-1	-5	-1	0.02	-20	-15	-0.1	1.1	-3	-0.01	-0.05	-0.5	0.6	-0.5	-1	-50	3.7	7	-5	0.7	-0.2	-0.5	0.4	0.06	28.73	-2	3	4	4	-0.4	7	249	235	-0.5	-5	6	40.68	0.008	0.36	0.02	0.34	0.14	6	-2	-2	-5	-4	13.2	0.045
RE-NE96-03-012	464172	6334654	Moberley Memb.	-2	-5	1.4	120	2.8	35	3	20	1	2.81	-1	-1	-5	-1	0.04	-20	31	0.1	3.5	-3	-0.01	-0.05	-0.5	2.1	-0.5	-1	-50	7.6	17	6	1.2	0.3	-0.5	0.6	0.1	25.59	-2	8	4	16	-0.4	13	532	277	-0.5	-5	21	35	0.017	0.94	0.07	1.49	0.66	6	-2	-2	-5	-4	10.6	0.021
RE-NE96-03-013	464172	6334654	Nodular fraction from -012	-2	-5	-0.5	120	2.5	37	3	16	1	1.48	-1	-1	-5	-1	0.04	-20	22	0.1	3.1	-3	-0.01	-0.05	-0.5	2	-0.5	-1	-50	7.1	14	-5	1.1	0.3	-0.5	0.5	0.07	28.42	-2	7	4	11	-0.4	11	287	304	-0.5	-5	17	36.77	0.016	0.99	0.05	1.21	0.56	6	-2	-2	-5	-4	11.4	0.014
RE-NE96-03-014	464172	6334654	Matrix fraction from -012	-2	-5	3	250	2.9	23	10	45	3	6.05	2	-1	-5	-1	0.1	-26	43	0.3	7	-3	-0.01	0.09	0.9	4.9	-0.5	-1	-50	15	31	12	2.2	0.5	-0.5	1	0.15	22.07	-2	15	6	35	0.5	31	1049	206	-0.5	-5	43	21.52	0.028	2.04	0.12	2.95	1.32	8	-2	-2	-5	-4	7.69	0.042
RE-NE96-03-015	464172	6334654	Matrix fraction from -001 to -003	-2	-5	2	270	-0.5	21	10	43	3	2.61	2	-1	-5	-1	0.09	-22	55	-0.1	6.6	-3	-0.01	-0.05	-0.5	4.8	-0.5	-1	-50	14	27	11	1.9	0.5	-0.5	1	0.15	22.37	-2	13	7	27	-0.4	27	455	243	-0.5	-5	40	22.92	0.024	2.84	0.13	2.87	1.28	7	-2	-2	-5	-4	8.60	0.026
RE-NE96-03-016	464172	6334654	Matrix fraction from -003 to -005	-2	-5	1.9	340	2.3	26	9	39	3	3	2	-1	-5	-1	0.08	-21	62	-0.1	6.3	-3	-0.01	-0.05	-0.5	4.6	-0.5	-1	-50	14	24	11	1.9	0.4	-0.5	1	0.15	23.95	-2	13	11	29	-0.4	27	512	210	-0.5	-5	41	22.78	0.022	1.82	0.13	2.88	1.27	7	-2	2	-5	-4	8.10	0.032
RE-NE96-04-001	463644	6336579	Beaver River Fm. Sandstone	-2	-5	-0.5	53	-0.5	-1	-1	6	-1	0.08	12	-1	-5	-1	-0.01	-20	-15	0.2	1.5	-3	-0.01	-0.05	1.1	1.3	1.6	-1	-50	1	4	-5	0.2	-0.2	-0.5	1.5	0.24	34.04	-2	4	4	2	-0.4	3	24	2	-0.5	-5	7	0.13	0.002	0.01	0.26	0.05	0.01	2	-2	-2	-5	-4	0.31	0.025
RE-NE96-05-001	530004	6289540	Firebag Fm.	-2	-5	1.5	-50	2.4	37	5	27	2	1.53	-1	-1	-5	-1	0.05	-20	42	-0.1	5.3	-3	-0.01	-0.05	-0.5	2.4	-0.5	-1	-50	9.7	18	6	1.6	0.4	-0.5	0.8	0.12	23.09	-2	13	4	19	-0.4	16	382	282	-0.5	-5	27	32.04	0.015	0.84	0.07	1.9	0.79	7	-2	-2	-5	-4	10.4	0.252
RE-NE96-05-002	530004	6289540	Firebag Fm.	-2	-5	1.9	200	2.7	35	5	33	2	1.6	1	-1	-5	-1	0.06	-20	50	0.2	6.1	-3	-0.01	-0.05	-0.5	3.5	1.2	2	-50	12	22	9	1.9	0.5	-0.5	1	0.15	24.68	-2	9	7	18	-0.4	17	360	325	-0.5	-5	31	30.49	0.016	1.09	0.09	2.18	0.92	7	-2	-2	-5	-4	10.1	0.207
RE-NE96-05-003	530004	6289540	Firebag Fm.	-2	-5	2.2	290	3.2	27	8	47	3	2.23	2	-1	-5	-1	0.07	-20	69	0.2	8.2	-3	-0.01	-0.05	-0.5	5.6	-0.5	-1	-50	19	37	15	3.3	0.8	-0.5	1.9	0.29	24.7	-2	9	5	33	-0.4	20	512	242	-0.5	-5	41	23.89	0.028	1.17	0.15	2.88	1.24	11	-2	-2	-5	-4	8.14	0.213
RE-NE96-05-004	530004	6289540	Firebag Fm. float with pyrite	-2	-5	1.3	150	2.6	36	6	25	2	2.34	-1	-1	-5	-1	0.05	-20	37	-0.1	4.8	-3	-0.01	0.06	-0.5	2.8	-0.5	-1	-50	11	22	11	2.1	0.5	-0.5	1	0.15	26.34	-2	7	4	16	-0.4	16	510	277	-0.5	-5	23	30.55	0.021	0.7	0.07	1.61	0.7	8	-2	2	-5	-4	10.4	0.859
RE-NE96-05-005	530004	6289540	Firebag Fm. with diss. Py./Marc.	-2	-5	4.6	130	2.1	40	7	19	1	2.11	-1	-1	-5	1	0.05	-20	31	0.3	3.1	-3	-0.01	-0.05	-0.5	2.2	1.5	-1	-50	11	25	9	2.5	0.6	-0.5	0.9	0.15	25.82	-2	7	4	11	-0.4	18	597	201	-0.5	-5	15	34.12	0.013	0.54	0.05	1.09	0.45	11	-2	3	-5	-4	11.0	1.50
RE-NE96-06-001	498407	6278031	Christina Member calc-shale	-2	-5	-0.5	270	-0.5	4	22	18	-1	38.7	-1	-1	-5	-1	0.03	-29	-15	-0.1	4.6	-3	-0.01	-0.05	1.1	1.6	1.3	-1	110	7.9	15	7	2.1	0.7	0.6	1.9	0.23	39.28	-2	9	15	85	0.4	18	4583	89	-0.5	-5	15	3.86	0.133	0.47	0.03	0.98	0.37	46	-2	-2	-5	-4	9.01	0.142
RE-NE96-06-002	498407	6278031	Christina Member calc-shale	-2	-5	2.2	300	-0.5	-1	25	46	2	34.6	2	-1	-5	-1	0.05	-31	56	-0.1	12	-3	-0.01	0.06	-0.5	3.9	-0.5	-1	155	20	30	19	4.6	1.2	0.7	3.6	0.58	37	-2	16	21	123	-0.4	38	2873	74	-0.5	-5	82	1.97	0.134	0.64	0.09	2.72	1.01	37	-2	-2	-5	-4	3.99	0.108
RE-NE96-06-003	498407	6278031	Green clay (regolith?)	-2	-5	7.5	380	-0.5	-1	59	110	3	37.4	3	-1	-5	-1	0.06	-40	78	1.5	18	-3	-0.02	-0.05	1	7.8	12	-1	1600	40	70	75	21	6.7	4.7	20.7	2.79	27.4	-2	33	49	1342	1.2	98	1331	66	0.8	-5	342	0.49	0.184	0.38	0.15	4.52	1.02	125	5	4	-5	-4	3.35	0.270
RE-NE96-06-004	498407	6278031	Basal McMurray Fm.	3	-5	1.6	220	-0.5	-1	6	41	-1	0.29	4	-1	-5	2	0.02	-20	-15	-0.1	3.7	-3	-0.01	-0.05	-0.5	6.4	2.5	-1	58	53	67	74	11	2.9	1	1.5	0.22	28.39	-2	5	16	31	-0.4	13	80	247	-0.5	-5	149	0.08	0.062	0.02	0.07	3.1	0.12	11	-2	2	-5	-4	2.53	0.197
RE-NE96-06-005	498407	6278031	Basal McMurray Fm.	-2	-5	0.8	-50	-0.5	-1	1	36	-1	0.88	4	-1	-5	-1	0.03	-20	-15	0.1	2.6	-3	-0.01	-0.05	1	4	1.6	-1	-50	18	36	14	1.7	0.4	-0.5	0.6	0.1	24.59	-2	3	15	10	-0.4	4	16	25	-0.5	-5	77	0.05	0.007	0.02	0.08	2.58	0.05	2	-2	4	-5	-4	0.664	0.154
RE-NE96-06-006	498407	6278031	Rusty-weathered pebble lag	-2	-5	6.5	260	-0.5	-1	20	39	-1	4.13	39	-1	-5	-1	0.04	-20	-15	0.4	5.6	-3	-0.01	-0.05	-0.5	21	5.7	-1	185	52	110	34	6.9	1	-0.5	4.3	0.66	38.98	-2	8	21	161	-0.4	33	163	25	-0.5	-5	60	0.04	0.027	0.03	0.16	1.41	0.29	12	-2	2	-5	-4	2.73	0.304
RE-NE96-06-007	498407	6278031	McMurray Fm. oil sands	-2	-5	1.1	160	-0.5	-1	1	22	-1	0.16	15	-1	-5	3	0.03	-20	-15	0.1	2.4	-3	-0.01	-0.05	-0.5	3.1	1.6	-1	-50	11	22	8	1.6	0.5	-0.5	1.7	0.26	39.44	-2	5	5	2	-0.4	8	23	19	-0.5	-5	26	0.01	0.004	0.01	0.17	0.65	0.27	4	-2	-2	-5	-4	2.63	0.193
RE-NE96-06-008	498407	6278031	Christina Member calc-shale	-2	-5	2.3	220	-0.5	3	13	34	2	40.2	1	-1	-5	-1	0.06	-31	44	0.2	5.3	-3	-0.01	-0.05	-0.5	2.4	1.8	-1	-50	9.2	15	6	1.5	0.3	-0.5	0.9	0.08	34.51	-2	11	4	23	-0.4	18	3675	60	-0.5	-5	26	2.59	0.15	1.02	0.06	1.64	0.65	11	-2	-2	-5	-4	6.00	0.203
RE-NE96-06-009	498407	6278031	Green clay (regolith?)	7	-5	3.1	460	-0.5	2	25	130	10	4.33	5	-1	-5	-1	0.16	-27	160	0.5	18	-3	-0.01	-0.05	-0.5	13	3.7	-1	62	40	80	31	5.8	1.3	0.9	3.1	0.33	19.83	-2	29	41	108	-0.4	66	404	105	-0.5	-5	118	3.07	0.044	1.72	0.38	8.41	3.42	17	2	-2	-5	-4	1.02	0.037
RE-NE96-06-010	498407	6278031	Altered Christina Memb.	-2	-5	0.6	71	2.7	44	3	12	1	1.13	-1	-1	-5	-1	0.03	-20	-15	-0.1	2.5	-3	-0.01	-0.05	-0.5	1	1.1	-1	60	5.9	12	5	1.2	0.4	-0.5	0.8	0.12	30.15	-2	6	5	61	-0.4	11	279	323	-0.5	-5	15	33.78	0.019	0.38	0.03	0.84	0.32	10	-2	-2	-5	-4	12.7	0.020
RE-NE96-06-011	498407	6278031	Unaltered Christina Memb.	-2	-5	1	61	4.1	40	2	11	-1	1.31	-1	-1	-5	-1	0.03	-20	-15	-0.1	1.7	-3	-0.01	0.06	-0.5	0.9	0.8	-1	-50	4.4	9	5	0.7	-0.2	-0.5	0.3	-0.05	30.13	-2	5	4	2	-0.4	7	317	312	-0.5	-5	9	31.16	0.016	1.64	0.02	0.69	0.25	6	-2	-2	-5	-4	12.5	0.045
RE-NE96-07-001	462503	6367404	Calumet or Moberley Memb.	-2	-5	2.2	220	3.3	32	7	49	3	1.74	2	-1	-5	2	0.07	-20	76	0.3	8.2	-3	-0.01	-0.05	-0.5	5	1.5	-1	-50	18	35	14	3	0.7	-0.5	1.6	0.24	24.83	-2	16	5	28	-0.4	19	488	248	-0.5	-5	47	24.07	0.031	0.92	0.15	3.35	1.2	13	-2	-2	-5	-4	8.80	0.070
RE-NE96-07-002	462503	6367404	Calumet or Moberley Memb.	-2	-5	1.3	85	5.8	40	6	11	-1	3.3	-1	-1	-5	-1	0.04	-20	-15	-0.1	1.7	-3	-0.01	-0.05	-0.5	1	-0.5	-1	-50	6.5	11	-5	1.1	0.3	-0.5	0.5	0.07	31.11	-2	6	4	4	-0.4	35	401	268	-0.5	-5	9	31.72	0.01	0.52	0.03	0.63	0.23	8	-2	-2	-5	-4	11.9	1.79
RE-NE96-08-001	461688	6368207	Calumet or Moberley Memb.	-2	-5	1.2	75	4.2	40	2	22	1	3.69	1	-1	-5	-1	0.04	-20	25	0.2	2.9	-3	-0.01	-0.05	-0.5	2.1	0.8	-1	-50	8.8	14	7	1.4	0.3	-0.5	0.8	0.12	28.51	-2	6	6	8	-0.4	6	1580	254	-0.5	-5	14	29.51	0.073	0.84	0.06	1.16	0.46	10	-2	-2	-5	-4	10.8	0.189
RE-NE96-08-002	461688	6368207	Calumet or Moberley Memb.	3	-5	1.7	100	3.5	37	3	26	1	1.94	1	-1	-5	-1	0.04	-20	27	0.2	3.9	-3	-0.01	-0.05	-0.5	2.7	-0.5	-1	-50	10	19	6	1.7	0.4	-0.5	1	0.15	24.96	-2	9	9	11	-0.4	6	920	237	-0.5	-5	19	28.78	0.086	0.81	0.07	1.54	0.61	12	-2	-2	-5	-4	10.4	0.693
RE-NE96-08-003	461688	6368207	Rusty-weathered 'rind'	-2	-5	1.9	-50	3.8	40	3	13	-1	1.72	-1	-1	-5	-1	0.02	-20	-15	-0.1	3.4	-3	-0.01	-0.05	-0.5	1.2	-0.5	-1	-50	6.4	11	5	1.2	0.3	-0.5	0.7	0.1	31.14	-2	23	4	7	-0.4	17	909	254	-0.5	-5	9	33.86	0.03	0.58	0.03	0.63	0.22	11	-2	-2	5	-4	11.7	0.702
RE-NE96-08-004	461688	6368207	Calumet or Moberley Memb.	-2	-5	1.3	63	4.8	41	3	22	1	1.03	1	-1	-5	-1	0.05	-20	27	-0.1	3.3	-3	-0.01	-0.05	-0.5	2.5	0.9	-1	-50	10	18	6	1.8	0.4	-0.5	1	0.15	26.24	-2	6	4	4	-0.4	8	522	252	-0.5	-5	13	31.75	0.031	1.18	0.06	1.22	0.54	11	-2	-2	-5	-4	11.1	0.158
RE-NE96-08-005	461688	6368207	Calumet or Moberley Memb.	-2	-5	1.9	110	5.4	35	2	15	1	5.04	-1	-1	-5	-1	0.04	-20	19	-0.1	4.6	-3	-0.01	-0.05	-0.5	2	-0.5	-1	-50	12	18	11	1.8	0.5	-0.5	1	0.15	28.47	-2	9	4	12	-0.4	9	675	272	-0.5	-5	15	26.84	0.052	0.67	0.04	1	0.38	17	-2	-2	-5	-4	9.22	3.32
RE-NE96-08-006	461688	6368207	Rusty-weathered 'rind'	3	-5	2.1	140	2.6	16	8	30	2	13.9	1	-1	-5	-1	0.04	-20	20	-0.1	4.1	-3	-0.01	-0.05	0.6	4.4	1	-1	68	11	20	6	1.7	0.4	-0.5	0.7	0.1	32.38	-2	22	9	46	-0.4	22	163	149	0.6	-5	24	14.24	0.047	0.25	0.07	1.65	0.61	8	-2	-2	7	-4	1.91	6.59
RE-NE96-09-001	461860	6368004	Brecciated calc-shale with 10% Py.	-2	-5	2.6	280	2.5	39	11	14	-1	1.56	1	-1	-5	-1	0.05	-20	-15	0.3	2.5	-3	-0.01	-0.05	-0.5	1.8	-0.5	-1	64	10	23	10	2.1	0.5	-0.5	0.9	0.13	29.17	-2	28	12	81	-0.4	35	674	317	-0.5	-5	10	29.75	0.019	0.68	0.04	0.75	0.29	11	-2	2	-5	-4	11.3	0.789
RE-NE96-09-002	461860	6368004	Brecciated calc-shale with 20% Py.	-2	-5	2.5	150	3.1	30	7	34	1	5.29	2	-1	-5	-1	0.05	-20	26	0.2	4.3	-3	-0.01	0.06	-0.5	3	-0.5	-1	-50	13	24	8	2.3	0.5	-0.5	1.3	0.21	26.55	-2	9	6	8	-0.4	21	701	224	-0.5	-5	21	21.02	0.025	2.33	0.08	1.78	0.77	10	-2	-2	-5	-4	9.12	3.54
RE-NE96-09-003	461860	6368004	Brecciated calc-shale with calcite	-2	-5	1.6	170	2.3	37	6	22	1	3.39	1	-1	-5	-1	0.04	-20	29	0.2	2.8	-3	-0.01	-0.05	0.6	2.2	0.7	-1	-50	9.1	19	9	1.5	0.4	-0.5	1	0.15	28.42	-2	6	6	9	-0.4	21	732	266	-0.5	-5	14	26.47	0.016	1.01	0.06	1.17	0.45	8	-2	2	-5	4	10.6	1.48
RE-NE96-10-001	454615	6336700	Moberley Memb.	-2	-5	3.4	87	2	43	2	9	-1	0.53	-1	-1	-5	-1	0.02	-20	-15	-0.1	1.5	-3	-0.01	-0.05	-0.5	1.2	0.7	-1	-50	4.7	9	-5	0.9	0.2	-0.5	0.4	0.06	29.38	-2	6	4	3	-0.4	5	174	231	-0.5	-5	7	31.66	0.008	0.3	0.03	0.43	0.18	6	-2	2	-5	-4	12.5	0.119
RE-NE96-10-002	454615	6336700	Moberley Memb.	-2	-5	2.4	86	4.4	37	4	18	1	1.58	2	-1	-5	-1	0.04	-20	28	-0.1	3.3	-3	-0.01	-0.05	-0.5	2.5	0.9	-1	-50	8.8	18	8	1.5	0.3	-0.5	0.9	0.14	27.26	-2	8	4	11	-0.4	10	449	214	-0.5	-5	19	28.16	0.012	0.58	0.07	1.32	0.51	7	-2	-2	-5	-4	11.0	0.141
RE-NE96-10-003	454615	6336700	Moberley Memb.	-2	-5	3.6	110	2.5	45	1	10	-1	0.5	-1	-1	-5	1	0.02	-20	-15	-0.1	3	-3	-0.01	-0.05	-0.5	1.3	1	-1	-50	5.6	11	7	1.1	0.3	-0.5	0.7	0.11	27.04	-2	6	4	2	-0.4	5	202	246	-0.5	-5	10	34.21	0.008	0.34	0.02	0.44	0.17	8	-2	2	-5	-4	13.7	0.086
RE-NE96-10-004	454615	6336700	Moberley Memb. with beehive texture	-2	-5	100	1200	-0.5	2	62	43	1	25.6	3	-1	-5	-1	0.03	-23	-15	0.9	2.8	-3	-0.01	0.19	-0.5	7.2	1.3	-1	286	45	98	31	7.6	1.9	1.3	2.7	0.43	37.49	-2	12	55	231	-0.4	107	6354	1323	0.6	-5	71	1.31	0.334	0.1	0.04	2	0.11	28	-2	2	-5	-4	5.96	16.0
RE-NE96-10-005	454615	6336700	Moberley Memb. with trace Py.	-2	-5	8.8	170	2	19	12	33	2	16.1	2	-1	-5	-1	0.06	-20	49	0.5	7.3	-3	-0.01	-0.05	-0.5	4	-0.5	-1	-50	11	23	10	2.2	0.6	-0.5	1.5	0.23	30.72	-2	15	16	27	0.4	44	3048	182	1.1	-5	50	16.37	0.088	1.01	0.08	1.66	0.6	13	-2	-2	-5	-4	9.53	2.06
RE-NE96-10-006	454615	6336700	Moberley Memb.	-2	-5	2.3	400	-0.5	-1	17	82	6	1.43	14	-1	-5	-1	0.18	87	91	0.4	11	-3	-0.01	-0.05	1.2	13	3.1	-1	-50	40	80	27	5.6	1.2	1.2	4.2	0.55	25.44	-2	18	13	53	-0.4	39	318	87	-0.5	-5	86	0.24	0.022	0.42	0.47	7.45	1.49	13	2	2	-5	-4	3.79	0.192
RE-NE96-11-001	530004	6289540	Firebag Memb.	2	-5	8.5	380	-0.5	-1	40	68	3	30.4	2	-1	-5	3	0.06	200	84	0.3	15	-3	-0.01	-0.05	-0.5	6.6	2.4	-1	175	35	82	38	9.7	2.6	1.9	5.1	0.67	24.65	-2	24	4	163	-0.4	78	2859	43	1.5	-5	70	1.19	0.094	0.74	0.15	4.46	1.58	52	2	-2	-5	-4	0.892	2.09
RE-NE96-11-002	530004	6289540	Firebag Memb.	-2	-5	10	450	-0.5	-1	15	130	8	4.72	7	-1	-5	-1	0.11	-28	180	0.6	21	-3	-0.01	-0.05	2.2	15	3.9	-1	142	92	190	66	14	3.3	1.5	5.7	0.77	19.61	-2	23	4	96	-0.4	48	267	84	-0.5	-5	132	0.24	0.099	1.5	0.41	8.03	3	31	2	2	-5	-4	0.233	0.376
RE-NE96-11-003	530004	6289540	Green clay (regolith?)	5	-5	11	470	-0.5	-1	15	130	8	4.31	7	-1	-5	2	0.12	-26	170	-0.1	23	-3	-0.01	-0.05	1.8	16	2.9	-1	173	71	140	60	12	2.7	-0.5	5.2	0.61	19.31	2	23	12	106	-0.4	46	232	73	-0.5	-5	145	0.11	0.104	1.52	0.44	8.5	3.2	26	2	-2	-5	-4	0.205	0.298
RE-NE96-11-004	530004	6289540	McMurray Fm. oil sands	-2	-5	58	370	-0.5	-1	3	76	1	8.9	6	-1	-5	-1	0.07	-20	39	0.6	7.5	-3	-0.01	-0.05	0.9	8.8	2.1	-1	-50	39	61	24	4.1	0.9	-0.5	1.8	0.23	29.01	-2	21	18	54	-0.4	12	33	229	-0.5	-5	114	0.05	0.069	0.1	0.19	5.75	0.81	10	-2	2	-5	-4	1.06	0.617
RE-NE96-11-005	530004	6289540	McMurray Fm. oil sands	-2	-5	4.6	420	1	-1	2	33	-1	0.32	4	-1	-5	-1	0.03	-20	-15	-0.1	2.9	-3	-0.01	0.09	-0.5	3.2	1.2	-1	-50	38	63	24	4.3	1	-0.5	0.8	0.14	27.06	-2	4	8	10	-0.4	6	27	717	-0.5	-5	43	0.16	0.192	0.02	0.12	3.37	0.31	7	-2	2	-5	-4	0.165	0.047
RE-NE96-11-006	530004	6289540	McMurray Fm. oil sands	6	-5	25	420	-0.5	-1	5	160	5	1.19	11	-1	-5	6	0.07	-26	57	0.4	18	-3	-0.01	-0.05	3.8	19	7	-1	-50	180	370	150	30	6.9	3.9	6.9	0.83	22.06	4	39	25	43	-0.4	34	61	84	-0.5	-5	164	0.11	0.039	0.34	0.52	9.68	1.02	78	2	2	-5	-4	5.61	0.151
RE-NE96-11-007	530004	6289540	Float from creek	-2	-5	2.4	240	-0.5	3	3	15	-1	17.3	11	-1	-5	-1	0.05	-20	-15	-0.1	2.8	-3	-0.01	-0.05	-0.5	5.5	1.5	-1	-50	31	59	20	4	0.9	0.6	2.4	0.29	38.64	-2	8	9	32	-0.4	8	4950	76	-0.5	-5	18	2.64	0.024	2.1	0.08	0.5	0.25	20	7	4	-5	-4	7.97	0.237
RE-NE96-12-001	464395	6338901	Erratic boulder (calc-shale?)	-2	-5	-0.5	86	2	45	1	-5	-1	0.64	-1	-1	-5	-1	0.02	-20	-15	0.3	1.5	-3	-0.01	-0.05	-0.5	0.7	0.5	-1	-50	4.5	10	6	0.9	0.2	-0.5	0.4	0.06	28.34	-2	4	38	8	-0.4	4	186	346	-0.5	-5	5	35.15	0.015	0.3	0.01	0.27	0.11	6	-2	-2	-5	-4	12.9	0.017
RE-NE96-13-001	464599	6338809	Beaver River Fm. Sandstone	-2	-5	-0.5	-50	-0.5	-1	-1	-5	-1	0.06	14	-1	-5	-1	-0.01	-20	-15	-0.1	0.7	-3	-0.01	-0.05	-0.5	0.5	0.8	-1	-50	0.6	-3	-5	0.1	-0.2	-0.5	1	0.18	34.45	-2	5	4	2	-0.4	6	19	2	-0.5	-5	14	0.06	0.002	0.01	0.08	0.03	0.01	2	-2	-2	-5	-4	4.00	0.276
RE-NE96-13-002	464599	6338809	Beaver River Fm. Sandstone	-2	-5	-0.5	-50	-0.5	-1	-1	-5	-1	0.1	11	-1	-5	1	-0.01	-20	-15	0.1	0.7	-3	-0.01	-0.05	-0.5	0.7	0.6	-1	-50	0.6	-3	-5	0.1	-0.2	-0.5	0.9	0.14	37.02	-2	4	4	2	-0.4	2	39	2	-0.5	-5	4	0.05	0.002	0.01	0.1	0.04	0.01	2	-2	2	-5	-4	0.52	0.038
RE-NE96-13-003	464599	6338809	Beaver River Fm. Sandstone	-2	-5	-0.5	-50	-0.5	-1	-1	6	-1	0.07	14	-1	-5	-1	-0.01	-20	-15	0.1	1.1	-3	-0.01	-0.05	0.8	1.2	1	-1	-50	0.8	-3	-5	0.2	-0.2	-0.5	1.4	0.23	39.95	-2	6	4	2	-0.4	2	39	2	-0.5	-5	5	0.01	0.002	0.01	0.24	0.05	0.01	2	-2	3	-5	-4	0.208	0.016
RE-NE96-14-001	475768	6287435	Moberley Memb.	-2	-5	2.4	100	2.5	40	2	11	-1	2.37	-1	-1	-5	-1	0.03	-20	-15	-0.1	2.2	-3	-0.01	-0.05	-0.5	1.2	0.6	-1	-50	7.1	10	7	1.1	0.3	-0.5	0.6	0.1	26.57	-2	7	8	7	-0.4	8	605	223	-0.5	-5	12	33.31	0.016	0.47	0.04	0.66	0.28	8	-2	2	-5	-4	12.0	0.075
RE-NE96-14-002	475768	6287435	Moberley Memb.	-2	-5	3.3	93	2.6	40	2	10	-1	0.81	2	-1	-5	-1	0.05	-20	-15	-0.1	2.5	-3	-0.01	-0.05	-0.5	1.7	0.7	-1	-50	8.7	12	8	1.3	0.3	-0.5	0.8	0.14	30.67	-2	7	4	7	-0.4	3	316	261	-0.5	-5	12	33.65	0.011	0.41	0.05	0.71	0.29	8	-2	-2	-5	-4	11.9	0.104
RE-NE96-14-004	475768	6287435	Float: rusty-weathered oil sands?	-2	-5	2.8	240	-0.5	10	5	26	2	28	1	-1	-5	-1	0.07	-27	59	0.3	4.9	-3	-0.01	-0.05	-0.5	2.6	-0.5	-1	-50	11	18	-5	1.5	0.3	-0.5	1.1	0.17	32.59	-2	11	4	34	-0.4	9	5764	145	2.7	-5	25	9.2	0.267	1.6	0.07	1.48	0.51	11	-2	2	-5	-4	9.72	0.214
RE-NE96-14-005	475768	6287435	McMurray Fm. oil sands	3	-5	1.4	270	-0.5	2	2	17	-1	1.46	13	-1	-5	-1	0.06	-20	19	0.1	4.5	-3	-0.01	-0.05	-0.5	5.8	1.4	-1	-50	19	41	18	2.9	0.6	0.6	2.2	0.36	39.27	-2	5	8	3	-0.4	8	255	78	-0.5	-5	20	2.41	0.009	0.12	0.16	1.02	0.52	8	-2	-2	-5	-4	3.35	0.200
RE-NE96-15-001	475381	6294226	Moberley Memb.	-2	-5	1.6	-50	3.9	40	2	12	-1	1.79	-1	-1	-5	-1	0.03	-20	-15	-0.1	1.8	-3	-0.01	-0.05	-0.5	1.3	1.1	-1	-50	5.5	10	-5	1	0.2	-0.5	0.6	0.1	28.62	-2	7	4	12	-0.4	8	202	225	-0.5	-5	9	32.72	0.006	0.48	0.04	0.63	0.23	7	-2	2	-5	-4	11.5	1.24
RE-NE96-16-001	475066	6297846	Moberley Memb.	3	-5	6.5	110	3.6	41	3	16	-1	1.03	-1	-1	-5	-1	0.03	-20	29	-0.1	2.5	-3	-0.01	-0.05	-0.5	2.1	1.3	-1	-50	7.1	13	6	1.2	0.3	-0.5	0.6	0.1	27.55	-2	10	9	12	-0.4	9	292	217	-0.5	-5	15	32.95	0.02	0.78	0.05	0.97	0.36	8	-2	-2	-5	-4	11.9	0.228
RE-NE96-16-002	475066	6297846	Moberley Memb.	-2	-5	1.7	95	4.5	42	3	11	-1	0.6	-1	-1	-5	-1	0.03	-20	-15	0.1	1.4	-3	-0.01	-0.05	-0.5	1	0.5	-1	-50	5.4	11	-5	1	0.2	-0.5	0.5	0.07	31.2	-2	5	4	8	-0.4	7	421	275	-0.5	-5	8	34.1	0.014	0.52	0.03	0.56	0.22	8	-2	-2	-5	-4	12.6	0.094
RE-NE96-16-003	475066	6297846	Rusty-weathered 'rind'	-2	-5	2.5	140	2	40	10	21	1	3.17	1	-1	-5	-1	0.04	-20	15	-0.1	3.7	-3	-0.01	-0.05	0.6	2.3	-0.5	-1	61	12	26	8	2.1	0.6	-0.5	0.9	0.14	25.02	-2	9	4	33	-0.4	20	1501	257	-0.5	-5	20	28.91	0.089	0.53	0.05	1.33	0.43	12	-2	-2	-5	-4	10.9	0.139
RE-NE96-17-001	474167	6306753	Moberley Memb.	-2	-5	0.7	69	2.4	43	1	8	-1	0.67	-1	-1	-5	-1	0.02	-20	-15	-0.1	1.3	-3	-0.01	-0.05	-0.5	1.1	-0.5	-1	-50	5.5	12	-5	1	0.2	-0.5	0.5	0.07	26.48	-2	5	6	2	-0.4	5	238	231	-0.5	-5	7	35.35	0.005	0.52	0.03	0.48	0.21	8	-2	-2	-5	-4	12.0	0.027
RE-NE96-18-001	472286	6313267	Basal McMurray Fm.	-2	-5	4.5	500	-0.5	-1	25	98	-1	18.8	6	-1	-5	-1	0.05	-26	-15	0.2	7.9	-3	-0.01	0.1	-0.5	9.2	3.2	-1	211	18	40	17	3.4	1	1	2.3	0.37	27.19	-2	8	18	206	-0.4	28	1352	460	-0.5	-5	199	0.5	0.228	0.12	0.12	4.8	0.5	17	2	-2	-5	-4	2.58	0.194
RE-NE96-18-002	472286	6313267	Basal McMurray Fm.	3	-5	8.4	190	-0.5	-1	59	57	2	14.1	22	-1	-5	5	0.04	170	41	-0.1	8.2	-3	-0.01	-0.05	-0.5	11	4.9	-1	132	36	80	31	5.6	1.2	-0.5	4	0.57	31.7	2	10	17	103	-0.4	115	2265	43	-0.5	-5	91	0.16	0.061	0.11	0.19	2.52	0.43	16	-2	3	-5	-4	6.20	0.916
RE-NE96-18-003	472286	6313267	Organic-rich clay	6	-5	3.8	210	-0.5	-1	13	60	4	1.3	18	-1	-5	-1	0.08	-20	62	0.5	11	-3	-0.01	-0.05	1.5	10	3.7	-1	57	37	80	29	5.8	1.3	0.7	4.6	0.67	28.15	-2	12	14	37	-0.4	28	346	43	-0.5	-5	81	0.07	0.014	0.22	0.37	4.62	0.89	18	2	-2	-5	-4	5.06	0.304
RE-NE96-19-001	468446	6324891	Moberley Memb.	4	-5	-0.5	75	3.2	40	3	16	-1	1.09	-1	-1	-5	2	0.03	-20	-15	-0.1	2.7	-3	-0.01	0.06	-0.5	1.7	1	-1	-50	6.5	13	6	1.1	-0.2	-0.5	0.6	0.1	26.07	-2	6	4	6	-0.4	7	252	381	-0.5	-5	13	30.47	0.013	1.39	0.05	1	0.4	7	-2	-2	-5	-4	11.7	0.093
RE-NE96-20-001	463087	6333871	Moberley Memb.	-2	-5	1.9	52	6.9	48	1	-5	-1	0.98	-1	-1	-5	-1	0.02	-20	-15	-0.1	0.6	-3	-0.01	-0.05	-0.5	0.2	-0.5	-1	-50	2	4	-5	0.3	-0.2	-0.5	0.2	-0.05	28.62	-2	8	14	4	-0.4	2	177	255	-0.5	-5	3	35.11	0.004	0.29	0.01	0.17	0.07	5	-2	-2	-5	-4	12.8	0.186
RE-NE96-21-001	461980	6337938	Moberley Memb.	-2	-5	1.6	110	2	37	3	33	2	1.33	2	-1	-5	-1	0.05	-20	24	-0.1	4.9	-3	-0.01	-0.05	1	4.1	1.1	-1	-50	15	31	10	2.2	0.5	-0.5	1.1	0.16	28.16	-2	8	11	8	-0.4	6	235	252	-0.5	-5	31	28.09	0.045	0.4	0.1	2.09	0.61	13	-2	-2	-5	-4	10.2	0.034
RE-NE96-22-001	463115	6342616	Float: rusty-weathered oil sands?	4	-5	-0.5	-50	-0.5	2	10	19	2	39.6	-1	-1	-5	-1	0.02	-30	28	0.3	11	-3	-0.01	-0.05	-0.5	1.2	-0.5	-1	-50	59	98	47	9.4	2.5	-0.5	5.1	0.71	43.06	-2	12	4	25	-0.4	14	5170	55	-0.5	-5	21	3.01	0.027	0.62	0.01	0.59	0.17	97	5	-2	-5	-4	10.9	0.025
RE-NE96-22-005	463115	6342616	Fine-grained McMurray Fm.	-2	-5	0.9	-50	-0.5	-1	1	38	-1	0.38	23	-1	-5	2	0.02	-20	-15	-0.1	3.7	-3	-0.01	-0.05	0.7	4.8	2.3	-1	-50	10	22	11	1.5	0.2	-0.5	2.6	0.38	31.96	-2	5	9	3	-0.4	9	42	10	-0.5	-5	38	0.02	0.003	0.03	0.23	1.02	0.07	5	-2	-2	-5	-4	5.84	0.419
RE-NE96-22-006	463115	6342616	McMurray Fm. oil sands	-2	-5	-0.5	-50	1.1	-1	1	27	-1	0.49	15	-1	-5	-1	0.04	-20	-15	-0.1	3.2	-3	-0.01	-0.05	-0.5	6	1.9	-1	-50	13	26	11	1.7	0.4	-0.5	1.9	0.25	33.51	2	4	6	2	-0.4	4	34	10	-0.5	-5	34	0.02	0.003	0.02	0.18	0.54	0.03	4	-2	-2	-5	-4	6.72	0.502
RE-NE96-23-002	460012	6339034	McMurray Fm. oil sands	-2	-5	1.5	280	-0.5	-1	2	31	-1	0.9	17	-1	-5	-1	0.1	-20	15	0.3	4.5	-3	-0.01	-0.05	1.1	6.6	2.2	-1	-50	22	46	16	3.4	0.8	-0.5	3.4	0.49	34.39	-2	6	10	8	-0.4	8	47	27	-0.5	-5	33	0.02	0.009	0.07	0.19	1.66	0.62	8	-2	-2	-5	-4	3.85	0.282
RE-NE96-23-003	460012	6339034	Float: rusty-weathered oil sands?	5	-5	-0.5	440	-0.5	1	7	31	-1	25.7	7	-1	-5	-1	0.09	-26	-15	-0.1	13	-3	-0.01	-0.05	-0.5	4	1.2	-1	-50	15	31	13	2.6	0.8	-0.5	3.3	0.49	40.11	-2	10	4	20	-0.4	12	13332	93	-0.5	-5	46	1.69	0.094	1.09	0.09	1.42	0.34	23	-2	-2	-5	-4	6.61	0.279

Appendix 1b. 1996 and 1997 Core Sample Geochemistry

Appendix 1b. 1996 and 1997 core sample geochemistry.

						Analysis by Activation Laboratories LTD--(Report 12575)--INAA																																				Analysis by Activation Laboratories LTD--Report 12575B--Total Digestion/Fire Assay ICP																				Rep. 12575C C,S-LECO			
Sample Number	Easting	Northing	Well name	Sample interval (m)	General rock description or formation	AU	AG	AS	BA	BR	CA	CO	CR	CS	FE	HF	HG	IR	MO	NA	NI	RB	SB	SC	SE	SN	SR	TA	TH	U	W	ZN	LA	CE	ND	SM	EU	TB	YB	LU	Mass	MO	CU	PB	ZN	AG	NI	MN	SR	CD	BI	V	CA	P	MG	TI	AL	K	Y	BE	AU	PT	PD	C	S
						PPB	PPM	PPM	PPM	PPM	%	PPM	PPM	PPM	%	PPM	PPM	PPB	PPM	%	PPM	PPM	PPM	PPM	PPM	%	%	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	g	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	%	%	%	%	%	%	PPM	PPM	PPB	PPB	PPB	%	%
					Detection limit -->	**2**	**5**	**0.5**	**50**	**0.5**	**1**	**1**	**5**	**1**	**0.01**	**1**	**1**	**5**	**1**	**0.01**	**20**	**15**	**0.1**	**0.1**	**3**	**0.01**	**0.05**	**0.5**	**0.2**	**0.5**	**1**	**50**	**0.5**	**3**	**5**	**0.1**	**0.2**	**0.5**	**0.2**	**0.05**	**0**	**2**	**1**	**4**	**1**	**0.4**	**1**	**1**	**1**	**0.5**	**5**	**2**	**0.01**	**0**	**0.01**	**0.01**	**0.01**	**0.01**	**2**	**2**	**0**	**0**	**0**	**0.01**	**0.01**
RE-NE96-25-001	463726	6341841	ATH-1	52.12-52.32	McMurray Fm.	-2	-5	5.8	300	-0.5	-1	12	100	6	1.14	12	-1	-5	-1	0.24	-22	120	0.5	14	-3	-0.01	-0.05	-0.5	13	4.3	-1	-50	38	80	33	5.9	1.4	-0.5	4.2	0.66	26.87	-2	21	15	66	-0.4	27	38	84	0.7	-5	96	0.13	0.013	0.46	0.4	6.19	1.52	20	-2	2	-5	-4	3.25	0.256
RE-NE96-25-002	463726	6341841	ATH-1	53.00-53.30	McMurray Fm.	-2	-5	9	310	-0.5	-1	15	98	7	3.41	11	-1	-5	-1	0.29	-24	120	0.5	15	-3	-0.01	-0.05	1.8	11	3.7	-1	141	43	86	30	5.2	1.3	-0.5	3.7	0.6	29.55	-2	17	16	93	-0.4	39	305	107	-0.5	-5	106	0.12	0.022	0.56	0.43	7.86	1.47	20	-2	2	-5	-4	2.2	2.55
RE-NE96-25-003	463726	6341841	ATH-1	53.65-54.45	McMurray Fm.	4	-5	1.8	140	-0.5	-1	10	39	3	2.62	7	-1	-5	-1	0.15	-20	25	0.2	6.1	-3	-0.01	-0.05	-0.5	5.7	1.8	-1	50	17	35	15	2.3	0.5	-0.5	1.8	0.32	35.07	-2	12	9	48	-0.4	37	74	55	-0.5	-5	40	0.17	0.01	0.2	0.2	2.7	0.31	11	-2	2	-5	-4	7.08	2.64
RE-NE96-25-004	463726	6341841	ATH-1	54.64-54.79	Moberley Fm.	-2	-5	3	300	-0.5	6	11	76	6	2.84	4	-1	-5	-1	0.16	-21	110	0.4	12	-3	-0.01	-0.05	-0.5	9.2	2.3	4	-50	28	55	20	4.4	1	1.3	2.3	0.38	27.63	-2	16	6	30	-0.4	31	205	147	-0.5	-5	72	6.49	0.055	1.41	0.25	5.79	2.29	16	-2	-2	-5	-4	2.54	2.06
RE-NE96-25-005	463726	6341841	ATH-1	55.16-55.36	Sideritized Moberly Fm.	-2	-5	1.4	230	-0.5	5	5	46	3	22.2	2	-1	-5	-1	0.1	-25	60	0.2	8.2	-3	-0.01	-0.05	-0.5	5	1.7	-1	-50	18	34	13	2.7	0.7	-0.5	1.5	0.27	39.08	-2	20	4	35	-0.4	21	6697	102	-0.5	-5	55	4.28	0.108	1.93	0.14	3.51	1.47	16	2	-2	-5	-4	7.36	0.314
RE-NE96-26-001	468262	6339898	ATH-2	28.35-28.85	McMurray Fm.	-2	-5	1.8	240	-0.5	-1	4	46	2	0.49	22	-1	-5	-1	0.12	-20	33	0.4	6.5	-3	-0.01	-0.05	1.3	9.6	3.5	-1	-50	27	60	20	4.2	1	0.8	4.3	0.65	34.73	-2	10	9	21	0.4	7	78	38	-0.5	-5	33	0.11	0.01	0.13	0.26	2.1	0.57	12	-2	-2	-5	-4	0.5	0.078
RE-NE96-26-002	468262	6339898	ATH-2	30.57-30.77	McMurray Fm.	-2	-5	2.3	380	-0.5	-1	6	73	5	1.61	11	-1	-5	-1	0.25	-22	62	0.7	13	-3	-0.01	-0.05	1.9	14	4.1	-1	-50	44	95	37	7.1	1.7	1	4.5	0.73	29.17	-2	20	19	40	-0.4	16	167	88	-0.5	5	81	0.14	0.018	0.34	0.46	6.35	1.25	23	-2	-2	-5	-4	1.99	0.048
RE-NE96-26-003	468262	6339898	ATH-2	31.69-31.87	McMurray Fm.	5	-5	2.4	380	-0.5	-1	19	91	7	1.46	8	-1	-5	5	0.39	-23	110	0.6	16	-3	-0.01	-0.05	1.5	13	4.4	-1	129	41	85	28	6.4	1.3	-0.5	3.7	0.58	29.98	2	25	22	87	-0.4	35	66	125	0.6	-5	117	0.17	0.036	0.58	0.54	10.12	1.56	23	-2	3	-5	-4	2.66	0.12
RE-NE96-26-004	468262	6339898	ATH-2	31.89-32.19	Firebag Fm.	-2	-5	3.1	190	-0.5	5	4	41	2	25.6	2	-1	-5	-1	0.1	-26	55	-0.1	11	-3	-0.01	-0.05	-0.5	4.2	2.1	-1	-50	17	33	10	2.7	0.7	-0.5	2.3	0.31	41.56	-2	20	5	40	-0.4	17	5891	83	-0.5	-5	49	4.46	0.089	1.62	0.12	2.87	1.25	22	-2	-2	-5	-4	7.81	0.442
RE-NE96-28-001	464379	6340454	ATH-4	30.77-31.99	Moberley Fm.	2	-5	3.3	450	-0.5	2	15	140	10	7.71	7	-1	-5	5	0.35	-31	160	0.8	27	-3	-0.01	-0.05	-0.5	19	3.1	-1	155	77	150	68	14	3.5	2.2	6.6	1.01	30.72	-2	30	43	99	-0.4	39	556	254	-0.5	-5	146	0.28	0.049	1.02	0.47	11.58	2.73	46	4	3	-5	-4	1.04	0.034
RE-NE96-28-002	464379	6340454	ATH-4	35.14-35.50	Reddish-brown sandstone	-2	-5	1.4	130	-0.5	-1	15	66	3	2.44	7	-1	-5	-1	0.15	-20	54	0.3	7.1	-3	-0.01	-0.05	-0.5	9.1	2.2	-1	-50	18	33	10	2	0.5	-0.5	2.1	0.31	40.43	-2	12	15	20	1.8	26	106	46	-0.5	-5	72	0.12	0.014	0.29	0.26	3.96	0.79	8	-2	2	-5	-4	0.362	0.066
RE-NE96-28-003	464379	6340454	ATH-4	35.96-36.26	Reddish-brown sandstone	-2	-5	4.6	120	-0.5	7	10	60	3	2.89	7	-1	-5	-1	0.14	-20	46	0.4	8.8	-3	-0.01	-0.05	-0.5	9.1	2.1	-1	-50	22	44	18	2.7	0.6	-0.5	1.8	0.35	34.82	-2	14	15	22	-0.4	16	274	89	-0.5	-5	55	7.01	0.01	0.32	0.24	3.59	0.82	10	-2	3	-5	-4	2.63	0.081
RE-NE96-28-004	464379	6340454	ATH-4	37.79-38.69	Moberley Fm.	-2	-5	2.7	130	1.6	23	6	38	3	2.11	7	-1	-5	-1	0.1	-20	40	0.3	6.1	-3	-0.01	-0.05	0.6	6.3	1.8	-1	53	18	37	13	2.8	0.7	-0.5	2	0.31	34.09	-2	12	8	36	0.5	14	289	196	-0.5	-5	35	24.06	0.016	0.38	0.15	2.16	0.85	12	-2	-2	-5	-4	7.52	0.164
RE-NE96-29-001	470309	6346640	AL-1	85.70-86.50	McMurray Fm.	-2	-5	1.6	230	-0.5	-1	3	9	-1	2.36	2	-1	-5	-1	0.04	-20	-15	0.1	1.5	-3	-0.01	-0.05	-0.5	3.8	0.9	-1	-50	11	22	11	1.6	0.4	-0.5	0.7	0.12	48.95	-2	7	5	15	-0.4	8	32	33	-0.5	-5	15	0.4	0.008	0.03	0.07	0.96	0.57	5	-2	-2	-5	-4	1.43	2.56
RE-NE96-29-002	470309	6346640	AL-1	86.50-86.75	Firebag Fm.	-2	-5	4.1	200	-0.5	-1	9	39	2	26.3	3	-1	-5	1	0.06	-21	41	0.2	6.8	-3	-0.01	-0.05	-0.5	4.8	1.6	-1	61	16	32	12	2.6	0.7	-0.5	1.6	0.34	52.26	-2	21	7	20	-0.4	76	104	45	-0.5	-5	46	0.46	0.14	0.22	0.11	2.89	1.19	22	-2	-2	-5	-4	0.393	>30.0
RE-NE96-29-003	470309	6346640	AL-1	306.22-306.92	Reddish gravelly-sandstone	-2	-5	-0.5	1200	6.2	6	6	13	-1	1.23	3	-1	-5	-1	0.3	-20	67	-0.1	2.5	-3	-0.01	-0.05	-0.5	11	1.7	-1	-50	38	82	20	3.2	0.8	-0.5	0.9	0.17	43.53	-2	8	12	14	2.9	16	430	129	-0.5	-5	26	5.1	0.015	1.32	0.11	2.74	3.51	7	-2	-2	-5	-4	1.5	1.28
RE-NE96-29-004	470309	6346640	AL-1	307.37-308.50	Basement qtz, K-spar gneiss	6	-5	3	140	15	5	59	1700	1	8.02	3	-1	-5	-1	0.79	1100	46	-0.1	14	-3	-0.01	-0.05	1.6	3.1	2.5	-1	144	28	63	22	4.7	1	0.5	1.9	0.34	34.57	2	54	4	101	-0.4	1170	820	39	-0.5	-5	70	4.51	0.093	11.1	0.24	3.68	0.95	18	-2	4	-5	-4	1.76	0.069
RE-NE96-30-001	462606	6357912	Can-Amera Steepbank OV1-84	105.7	Organic-rich black shale	3	-5	4.7	310	-0.5	1	6	37	2	32.4	-1	-1	-5	-1	0.07	-23	30	0.3	6.5	-3	-0.01	0.17	-0.5	2.6	1	-1	70	29	61	23	5.3	1.4	0.8	1	0.17	51.62	-2	21	8	45	-0.4	89	3352	1555	-0.5	-5	32	0.47	0.192	0.24	0.08	1.67	0.44	17	-2	4	-5	-4	1.63	>30.0
RE-NE96-31-001	450612	6319177	Syncrude well 0215461	?	Moberley Fm.	-2	-5	4.6	200	-0.5	2	16	28	1	28.8	-1	-1	-5	-1	0.07	-22	32	-0.1	4.5	-3	-0.01	-0.05	-0.5	2.3	-0.5	-1	-50	15	31	10	2.5	0.6	0.6	1.4	0.21	48.35	-2	16	4	7	-0.4	18	8958	77	-0.5	-5	30	2.3	0.098	0.75	0.05	0.88	0.31	20	-2	-2	-5	-4	9.27	0.973
RE-NE96-32-001	439966	6315672	AOSRD UTF LD-9	157.75	Pyrite vein	9	-5	6.8	170	1.1	10	3	21	-1	11.4	24	-1	-5	-1	0.04	-20	-15	0.2	2.1	-3	-0.01	-0.05	-0.5	16	2.3	-1	-50	40	80	26	5.4	0.7	-0.5	2.5	0.44	47.32	-2	9	6	18	-0.4	7	704	149	-0.5	-5	10	10.21	0.035	0.14	0.1	0.33	0.19	11	-2	6	-5	-4	3.67	13.8
RE-NE96-32-002	439966	6315672	AOSRD UTF LD-9	158.1	Pyrite vein	-2	-5	11	130	1.6	18	2	12	-1	5.54	9	-1	-5	2	0.05	-20	-15	-0.1	1.4	-3	-0.01	-0.05	-0.5	5.6	1.1	-1	-50	14	31	12	2	0.4	-0.5	0.9	0.17	41.29	-2	7	4	13	-0.4	5	212	181	-0.5	-5	9	17.66	0.018	0.17	0.05	0.38	0.17	5	-2	-2	-5	-4	6.39	4.73
RE-NE96-32-003	439966	6315672	AOSRD UTF LD-9	159.12	Massive pyrite	-2	-5	23	4300	1.4	14	11	25	-1	20.6	2	-1	-5	-1	0.05	-20	-15	0.4	1.6	-3	-0.01	-0.05	0.5	2	0.6	-1	56	5.1	9	-5	0.7	-0.2	-0.5	0.4	0.09	43.86	2	13	9	46	-0.4	53	98	179	-0.5	-5	11	13.92	0.01	0.21	0.04	0.69	0.27	4	-2	2	5	-4	4.44	22.9
RE-NE96-33-001	481118	6380039	Shell EATHA EV 12-6-99-8W4	409.82	Moberley Fm.	-2	-5	8.6	100	3.3	44	1	10	-1	2.87	-1	-1	-5	7	0.03	-20	-15	0.5	2.2	-3	-0.01	-0.05	-0.5	0.6	2.7	-1	-50	5.1	12	6	1	0.3	-0.5	0.6	0.1	38.01	5	13	21	9	0.4	9	200	210	-0.5	-5	7	44.93	0.024	0.29	0.01	0.25	0.15	7	-2	2	-5	-4	11.5	2.89
RE-NE96-33-002	481118	6380039	Shell EATHA EV 12-6-99-8W4	376.75	McMurray Fm.	-2	-5	8.2	500	-0.5	6	6	12	-1	1.22	2	-1	-5	-1	0.07	-20	32	0.1	1.3	-3	-0.01	-0.05	-0.5	4.3	0.8	-1	-50	13	26	11	1.8	0.4	-0.5	0.5	0.09	44.86	-2	4	7	26	-0.4	5	103	92	-0.5	-5	10	6.96	0.005	0.08	0.03	1.42	1.13	4	-2	-2	-5	-4	1.87	1.16
RE-NE96-34-001	466527	6323064	Mildred OV3-84	?	Moberley Fm.	-2	-5	2.9	240	-0.5	22	4	24	2	12.4	1	-1	-5	-1	0.08	-22	40	-0.1	4.2	-3	-0.01	-0.05	0.7	3.4	-0.5	-1	-50	11	23	7	1.7	0.4	-0.5	1	0.18	38.14	-2	15	5	40	-0.4	10	2244	261	-0.5	-5	29	22.76	0.119	1.2	0.08	1.65	0.77	10	2	-2	-5	-4	9.51	0.191

						Analysis by Activation Laboratories LTD--(Report 13628)--INAA																																				Analysis by Activation Laboratories LTD--Report 13628B--Total Digestion/Fire Assay ICP																				Rep. 14157C C,S-LECO			
Sample Number	Easting	Northing	Well name	Sample interval (m)	General rock description or formation	AU	AG	AS	BA	BR	CA	CO	CR	CS	FE	HF	HG	IR	MO	NA	NI	RB	SB	SC	SE	SN	SR	TA	TH	U	W	ZN	LA	CE	ND	SM	EU	TB	YB	LU	Mass	MO	CU	PB	ZN	AG	NI	MN	SR	CD	BI	V	CA	P	MG	TI	AL	K	Y	BE	AU	PT	PD	C	S
						PPB	PPM	PPM	PPM	PPM	%	PPM	PPM	PPM	%	PPM	PPM	PPB	PPM	%	PPM	PPM	PPM	PPM	PPM	%	%	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	g	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	%	%	%	%	%	%	PPM	PPM	PPB	PPB	PPB	%	%
					Detection limit -->	**2**	**5**	**0.5**	**50**	**0.5**	**1**	**1**	**5**	**1**	**0.01**	**1**	**1**	**5**	**1**	**0.01**	**20**	**15**	**0.1**	**0.1**	**3**	**0.01**	**0.05**	**0.5**	**0.2**	**0.5**	**1**	**50**	**0.5**	**3**	**5**	**0.1**	**0.2**	**0.5**	**0.2**	**0.05**	**0**	**2**	**1**	**4**	**1**	**0.4**	**1**	**1**	**1**	**0.5**	**5**	**2**	**0.01**	**0**	**0.01**	**0.01**	**0.01**	**0.01**	**2**	**2**	**2**	**5**	**4**	**0.01**	**0.01**
RE-NE97-39-002	489920	6299044	Mobile Clarke OV11-26-90-8	197.79	Christina Memb.	-5	8.9	180	1.2	7	8	38	1	25.2	1	-1	-5	-1	0.07	-20	41	0.3	5	-3	-0.01	-0.05	-0.5	2.8	1.3	4	-50	10	21	5	2	0.6	-0.5	1.2	0.18	37.86		-2	20	4	11	0.4	42	1327	131	-0.5	-5	61	7.61	0.121	1.01	0.08	2.21	0.74	14	-2	-2	-5	-4	5.5	18.56
RE-NE97-39-003	489920	6299044	Mobile Clarke OV11-26-90-8	196.15	Rusty-weathered 'rind'	-5	15	120	-0.5	9	14	48	2	28	2	-1	-5	-1	0.12	-20	46	0.3	7.5	-3	-0.02	-0.05	0.7	4.2	1.7	6	-50	15	32	13	3.1	0.8	-0.5	2	0.37	20.41		-2	21	4	10	0.6	28	1935	145	-0.5	-5	77	8.53	0.164	1.1	0.09	2.23	0.77	19	-2	-2	-5	-4	7.63	4.13
RE-NE97-39-004	489920	6299044	Mobile Clarke OV11-26-90-8	196.1	Buff-white clay	-5	16	410	-0.5	12	15	40	-1	5.52	6	-1	-5	10	0.21	-20	160	0.7	13	-3	-0.03	0.08	1.3	11	3	6	-50	37	71	27	6.2	1.5	1.1	3.2	0.53	17.09		-2	18	9	39	-0.4	23	460	214	-0.5	-5	107	11.2	0.073	1.5	0.29	5.59	2.1	22	-2	-2	-5	-4	4.9	0.74
RE-NE97-39-005	489920	6299044	Mobile Clarke OV11-26-90-8	195.1	Basal McMurray Fm.	-5	29	-50	-0.5	-1	20	40	-1	2.8	7	-1	-5	5	0.04	-20	18	0.5	2.7	-3	-0.02	-0.05	0.8	26	3.2	-1	116	57	120	42	7	0.7	-0.5	1.6	0.26	39.26		-2	10	18	84	-0.4	22	372	138	-0.5	-5	39	0.22	0.041	0.08	0.12	1.6	0.16	14	-2	-2	-5	-4	3.04	1.08
RE-NE97-39-006	489920	6299044	Mobile Clarke OV11-26-90-8	192.8	McMurray Fm./honeycomb texture	-5	2.3	95	-0.5	-1	8	16	-1	7	3	-1	-5	3	0.04	-20	-15	-0.1	1.3	-3	-0.01	-0.05	-0.5	4.2	1.5	1	-50	15	35	12	2.6	0.5	-0.5	1	0.17	36.83		-2	7	7	29	-0.4	10	730	26	-0.5	-5	19	0.55	0.05	0.03	0.04	0.6	0.1	8	-2	-2	-5	-4	2.81	0.1
RE-NE97-40-001	495188	6297412	Mobile 1-89 Clarkeck OV	181.50-203.07	Pyrite-rich sections	-5	6.1	210	3.2	34	12	38	2	4.84	2	-1	-5	-1	0.11	-20	50	0.7	5	-3	-0.02	-0.05	-0.5	4.3	1.5	-1	-50	14	36	15	2.4	0.7	0.6	1.3	0.21	22.57		-2	11	4	18	-0.4	20	348	255	-0.5	-5	28	26.11	0.042	0.99	0.08	2.12	0.77	12	-2	-2	-5	-4	8.72	3.5

Appendix 2. 1999 Bedrock Sample Geochemistry

Appendix 2. 1999 bedrock sample geochemistry.

Sample ID	Easting	Northing	General rock description or formation	AU	AG	AS	BA	BR	CA	CO	CR	CS	FE	HF	HG	IR	MO	NA	NI	RB	SB	SC	SE	SN	SR	TA	TH	U	W	ZN	LA	CE	ND	SM	EU	TB	YB	LU	Mass	MO	CU	PB	ZN	AG	NI	MN	SR	CD	BI	V	CA	P	MG	TI	AL	K	Y	BE	S	AU	PT	PD
				INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP
				PPB	PPM	PPM	PPM	PPM	%	PPM	PPM	PPM	%	PPM	PPM	PPB	PPM	%	PPM	PPM	PPM	PPM	PPM	%	%	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	g	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	%	%	%	%	%	%	PPM	PPM	%	PPB	PPB	PPB
RE99-74E-01-001	464300	6334706	Moberley Memb.	-2	-5	7	-50	5.6	38	3	9	-1	0.79	-1	-1	-5	6	0.02	-20	-15	0.3	1.5	-3	-0.01	-0.05	-0.5	0.8	1.2	-1	-50	4.4	6	-5	0.8	-0.2	-0.5	0.3	-0.05	29.46	5	7	-5	46	-0.4	7	199	257	-0.5	-5	9	42.48	0.021	0.43	0.03	0.58	0.28	4	-2	-0.01	-2	-5	-4
RE99-74E-02-001	464400	6334142	Moberley Memb.	-2	-5	2.6	88	3.8	37	3	13	1	0.75	-1	-1	-5	5	0.02	-20	-15	-0.1	2	-3	-0.01	-0.05	-0.5	1.5	0.7	-1	-50	5.3	9	-5	0.8	-0.2	-0.5	0.3	-0.05	30.74	4	4	-5	50	-0.4	7	245	302	-0.5	-5	12	41.81	0.024	0.41	0.05	1	0.46	4	-2	-0.01	2	-5	-4
RE99-74E-02-002	464400	6334142	Bentonite	-2	-5	0.9	340	3.6	11	6	52	4	1.15	8	-1	-5	-1	0.05	-20	76	0.4	6.5	-3	-0.01	-0.05	-0.5	7.6	1.8	-1	-50	22.2	35	11	3.1	0.5	-0.5	1.6	0.23	24	2	23	18	64	-0.4	22	86	101	-0.5	-5	58	10.7	0.044	0.46	0.27	4.51	1.62	8	-2	0.01	-2	-5	-4
RE99-74E-03-001	464118	6334930	Moberley Memb.	-2	-5	-0.5	-50	2.3	37	3	5	-1	0.75	-1	-1	-5	4	0.02	-20	-15	-0.1	3.8	-3	-0.01	-0.05	-0.5	0.8	0.7	-1	-50	5.4	9	-5	1.7	0.4	-0.5	0.8	0.12	30.05	5	2	-5	53	-0.4	4	238	330	-0.5	-5	12	44.25	0.008	0.36	0.02	0.39	0.18	11	-2	-0.01	-2	-5	-4
RE99-74E-04-001	464118	6334930	Moberley Memb. with Py and Marc.	-2	-5	4.5	100	2.3	27	1	14	1	9.91	-1	-1	-5	2	0.02	-20	-15	-0.1	3.5	-3	-0.01	0.06	-0.5	1.2	0.7	-1	-50	6.2	10	-5	1.2	0.2	-0.5	1	0.15	31.91	3	4	-5	59	-0.4	5	2250	380	-0.5	-5	20	34.83	0.058	0.61	0.03	0.57	0.25	14	-2	-0.01	-2	-5	-4
RE99-74E-05-001	463740	6336484	Rusty Beaver River sandstone	-2	-5	2.8	280	0.6	2	4	25	-1	16.5	7	-1	-5	-1	0.06	-24	-15	-0.1	10.3	-3	-0.01	-0.05	-0.5	3.5	1.7	-1	-50	14.9	25	10	2.8	0.6	0.6	1.8	0.26	36.69	-2	4	5	33	-0.4	5	2953	76	-0.5	-5	40	2.39	0.066	1.03	0.11	1.64	0.49	18	2	0.09	-2	-5	-4
RE99-74E-13-003	463943	6337790	Float: rusty-weathered with Py (5%)	-2	-5	1.9	200	-0.5	3	8	36	1	26.4	1	-1	-5	-1	0.05	-20	42	-0.1	5.9	-3	-0.01	-0.05	-0.5	3.5	0.8	-1	76	11.6	21	7	1.6	0.3	-0.5	0.8	0.12	38.61	-2	11	8	69	-0.4	8	8599	63	-0.5	-5	44	2.26	0.135	0.54	0.11	2.71	0.91	10	2	0.18	-2	-5	-4
RE99-74E-13-004	458730	6340669	Nodular calc-shale	-2	-5	2.4	110	3.6	31	3	22	2	1.48	-1	-1	-5	3	0.03	-20	36	-0.1	3.6	-3	-0.01	-0.05	-0.5	2.6	1	-1	-50	9.3	15	7	1.5	0.2	-0.5	0.7	0.11	28.99	3	6	-5	54	-0.4	11	324	397	-0.5	-5	27	38.08	0.023	1.8	0.1	1.92	0.85	6	-2	-0.01	-2	-5	-4
RE99-74E-13-005	458730	6340669	Rusty-weathered clay (regolith?)	-2	-5	3.8	150	4.1	25	5	27	2	4.29	1	-1	-5	3	0.4	-20	53	0.2	4.5	-3	-0.01	-0.05	1.1	3.6	1.8	-1	-50	11.1	17	8	1.8	0.3	-0.5	0.9	0.14	26.09	3	6	-5	53	-0.4	15	674	380	-0.5	-5	30	31.56	0.037	2.16	0.1	2.18	1.01	8	-2	0.43	-2	-5	-4
RE99-74E-13-006	458730	6340669	Coluviated silty shale	-2	-5	2.6	250	5.5	-1	3	56	2	0.63	10	-1	-5	3	0.28	-21	-15	0.6	14	-3	-0.01	-0.05	2.2	14.7	6.7	4	-50	41.4	62	19	4.6	0.9	-0.5	3.1	0.45	27.68	4	9	51	11	0.4	16	19	194	-0.5	-5	72	0.21	0.009	0.23	0.9	7.12	0.2	18	2	0.08	-2	-5	-4
RE99-74E-27-003	479029	6401348	McMurray Fm.	-2	-5	6.3	250	0.9	-1	4	17	-1	1.37	7	-1	-5	-1	0.3	-20	24	0.3	2.6	-3	-0.01	-0.05	-0.5	8.1	1.8	-1	-50	23.3	38	12	3.2	0.5	-0.5	1.2	0.18	41.08	-2	2	9	16	-0.4	6	250	78	-0.5	-5	21	0.31	0.024	0.13	0.16	1.73	0.8	7	-2	0.02	-2	-5	-4
RE99-74E-35-003	463350	6339575	Float: sulphide nodules	12	-5	17.2	96	-0.5	-1	8	13	-1	32.3	4	-1	-5	-1	0.03	-21	20	0.6	1.2	4	-0.01	-0.05	-0.5	1.8	0.7	-1	-50	6.8	9	5	0.8	0.2	-0.5	0.5	0.08	46.13	-2	2	16	6	-0.4	21	124	13	-0.5	-5	5	0.04	0.005	0.02	0.07	0.55	0.22	4	-2	19.37	8	-5	-4
RE99-74E-35-004(O)	463350	6339575	McMurray Fm.	-2	-5	1.4	150	-0.5	-1	3	-5	-1	0.75	1	-1	-5	3	0.02	-20	-15	-0.1	0.4	-3	-0.01	-0.05	-0.5	1.3	-0.5	-1	-50	4.5	8	-5	0.7	0.2	-0.5	0.3	0.05	35.56	-2	2	13	4	-0.4	21	121	12	-0.5	-5	3	0.04	0.004	0.02	0.06	0.54	0.22	4	-2	19.37	10	-5	-4
RE99-74E-35-005	502155	6369397	Glacialfluvial till	-2	-5	2.3	180	4.4	-1	3	20	-1	1.04	15	-1	-5	-1	0.26	-20	23	0.2	3.3	-3	-0.01	-0.05	0.6	7.1	1.8	-1	-50	21.3	35	13	3	0.5	-0.5	1.5	0.23	40.43	-2	3	8	20	-0.4	5	218	64	-0.5	-5	18	0.98	0.035	0.47	0.17	1.71	0.59	10	-2	0.06	-2	-5	-4
RE99-74E-85-002	498037	6368858	McMurray Fm.	-2	-5	1.4	260	-0.5	1	8	26	-1	10.8	15	-1	-5	-1	0.06	-20	-15	-0.1	11.9	-3	-0.01	-0.05	0.5	7.2	2.7	-1	-50	26.7	46	17	4.5	0.9	0.7	2.7	0.41	38.77	-2	4	6	38	-0.4	9	2735	73	-0.5	-5	31	1.13	0.028	0.86	0.15	1.6	0.52	17	2	1.93	-2	-5	-4
RE99-74E-85-003	498037	6368858	McMurray Fm.	-2	-5	1.5	200	-0.5	-1	2	26	-1	0.55	15	-1	-5	1	0.05	-20	30	0.4	3.2	-3	-0.01	-0.05	0.6	4.8	1.9	-1	-50	19.3	32	13	2.9	0.5	-0.5	1.9	0.27	34.78	-2	3	7	11	-0.4	7	43	29	-0.5	-5	29	0.07	0.01	0.07	0.21	1.57	0.61	6	-2	0.22	-2	-5	-4
RE99-74E-85-004	498037	6368858	Float: sulphide nodules	3	-5	5.2	170	-0.5	1	7	17	-1	23.8	6	-1	-5	-1	0.03	-20	23	0.3	1.7	-3	-0.01	-0.05	-0.5	2.5	0.8	-1	-50	10	16	5	1.3	0.3	-0.5	0.8	0.12	41.86	-2	2	8	4	-0.4	17	31	20	-0.5	-5	35	0.03	0.005	0.01	0.03	0.41	0.37	2	-2	0.09	-2	-5	-4
RE99-74E-85-005	498037	6368858	McMurray Fm.	2	-5	2.4	230	-0.5	1	6	24	-1	9.51	14	-1	-5	-1	0.06	-20	31	0.2	9.6	-3	-0.01	-0.05	-0.5	5.6	1.4	-1	-50	22.2	38	14	3.6	0.7	-0.5	2	0.31	40.11	-2	3	6	29	-0.4	9	2559	74	-0.5	-5	27	1.21	0.021	0.98	0.14	1.51	0.52	13	-2	1.36	-2	-5	-4
RE99-74E-85-006	498037	6368858	McMurray Fm.	-2	-5	4.1	190	-0.5	-1	3	22	1	19.2	8	-1	-5	-1	0.04	-20	-15	0.4	2.2	-3	-0.01	-0.05	0.6	3.1	1.1	-1	-50	12.2	19	8	1.7	0.3	-0.5	1.1	0.17	37.25	-2	12	7	11	-0.4	13	48	29	-0.5	-5	18	0.09	0.004	0.04	0.12	1.25	0.44	4	-2	13.33	2	-5	-4
RE99-74E-85-007	498037	6368858	McMurray Fm.	-2	-5	3.7	220	-0.5	-1	2	24	-1	0.75	14	-1	-5	-1	0.06	-20	27	0.3	3.2	-3	-0.01	-0.05	0.8	4.6	1.6	-1	-50	16.9	29	9	2.5	0.5	-0.5	1.7	0.26	33.3	-2	4	9	11	-0.4	7	37	33	-0.5	-5	31	0.04	0.015	0.06	0.2	1.44	0.65	6	-2	0.34	-2	-5	-4
RE99-74E-85-008	498037	6368858	Sulphide nodule	8	-5	4.7	130	-0.5	-1	3	16	-1	20.6	6	-1	-5	-1	0.04	-20	31	0.3	1.6	-3	-0.01	-0.05	0.5	2.2	0.9	-1	-50	9.1	13	6	1.2	0.2	-0.5	0.9	0.13	43.51	-2	5	6	7	-0.4	8	42	19	-0.5	-5	12	0.06	0.002	0.02	0.1	0.91	0.35	4	-2	15.73	-2	-5	-4
RE99-74E-85-009	498037	6368858	Sulphide nodule	-2	-5	2.2	140	-0.5	-1	2	18	-1	18.5	7	-1	-5	-1	0.03	-20	21	0.2	1.8	-3	-0.01	-0.05	-0.5	2.5	1.1	-1	-50	9.5	15	-5	1.3	0.2	-0.5	1	0.16	38.61	-2	5	-5	7	-0.4	6	34	19	-0.5	-5	15	0.14	0.002	0.03	0.1	0.96	0.35	4	-2	13.33	-2	-5	-4
RE99-74E-85-010	498037	6368858	Carbon-rich McMurray Fm.	-2	-5	4.5	170	-0.5	-1	3	21	-1	8.99	12	-1	-5	-1	0.05	-20	25	0.3	2.9	-3	-0.01	-0.05	0.6	3.8	1.6	-1	-50	15.2	24	10	2.2	0.4	-0.5	1.6	0.23	35.4	-2	5	7	14	-0.4	8	44	37	-0.5	-5	21	0.11	0.007	0.05	0.14	1.48	0.5	5	-2	6.72	-2	-5	-4
RE99-74E-85-011	498037	6368858	McMurray Fm.	-2	-5	2.2	210	-0.5	15	7	23	2	1.86	8	-1	-5	-1	0.06	-20	32	0.2	6.8	-3	-0.01	-0.05	-0.5	4.9	1.7	-1	-50	17.6	29	11	2.7	0.5	-0.5	1.6	0.24	31.88	2	4	-5	52	-0.4	9	3411	377	-0.5	-5	21	15.63	0.019	0.48	0.16	2.16	0.6	8	-2	1.6	-2	-5	-4
RE99-74E-85-012	498037	6368858	Bentonite in McMurray Fm.	-2	-5	4.2	240	-0.5	-1	2	34	2	1.99	13	-1	-5	-1	0.09	-20	56	0.4	5.4	-3	-0.01	-0.05	1	6.3	2.5	-1	-50	22.9	38	15	3.2	0.6	-0.5	2.2	0.33	30.2	-2	4	16	18	-0.4	5	61	99	-0.5	-5	40	0.7	0.018	0.14	0.24	3.41	1.11	7	-2	1	-2	-5	-4
RE99-74E-85-014	498037	6368858	Altered McMurray Fm.	-2	-5	22.2	210	-0.5	12	3	14	-1	6.3	5	-1	-5	2	0.06	-20	-15	0.2	8.9	-3	-0.01	-0.05	-0.5	1.4	0.8	-1	-50	7.4	14	-5	1.5	0.4	-0.5	0.6	0.09	22.44	2	2	-5	43	-0.4	13	931	294	-0.5	-5	71	12.9	0.029	0.17	0.04	0.5	0.16	7	-2	6.24	-2	-5	-4
RE99-74E-95-001	459601	6339870	McMurray Fm. .with massive Py	5	-5	19.8	110	-0.5	-1	12	16	1	22.5	9	2	-5	-1	0.05	81	-15	1.3	2.5	-3	-0.01	-0.05	0.5	4.1	1.6	-1	-50	14.7	26	9	2.5	0.5	-0.5	1.3	0.2	40.46	-2	5	9	19	-0.4	79	221	32	-0.5	-5	18	0.1	0.02	0.02	0.06	0.82	0.23	7	-2	14.32	4	-5	-4
RE99-74E-95-002	459601	6339870	McMurray Fm. with massive Py.	-2	-5	4.2	170	-0.5	1	3	29	2	30.3	2	-1	-5	-1	0.03	-25	49	0.3	11.8	-3	-0.01	-0.05	-0.5	3.3	1.1	-1	-50	12.6	21	7	2	0.5	-0.5	1.5	0.24	41	-2	5	7	39	-0.4	5	6993	49	-0.5	-5	51	1.26	0.111	0.5	0.11	2.28	0.52	20	-2	0.11	-2	-5	-4
RE99-74E-95-003	459601	6339870	McMurray Fm. with massive Py.	-2	-5	6.1	200	-0.5	1	7	31	1	29.8	3	-1	-5	-1	0.04	-27	44	0.6	14.5	-3	-0.01	-0.05	-0.5	4	-0.5	-1	-50	15.1	24	8	2.5	0.5	-0.5	1.9	0.3	38.61	-2	5	15	38	-0.4	8	6725	56	-0.5	-5	60	1.25	0.111	0.64	0.11	2.25	0.53	23	2	0.71	-2	-5	-4
RE99-74E-96-001	459519	6338652	Moberley Memb.	-2	-5	4	180	3.5	27	7	34	3	2.24	2	-1	-5	3	0.05	-20	64	0.3	5.8	-3	-0.01	-0.05	0.6	4.3	1.6	-1	-50	14.5	22	8	2.2	0.4	-0.5	1	0.15	28.6	3	8	-5	59	-0.4	16	368	267	-0.5	-5	37	29.81	0.026	1.59	0.13	2.63	1.18	7	-2	0.17	-2	-5	-4
RE99-74E-96-002	459519	6338652	Sideritized Moberley Memb.	-2	-5	2.4	62	2.6	35	1	15	1	0.62	-1	-1	-5	4	0.03	-20	23	0.1	4.3	-3	-0.01	-0.05	-0.5	1.7	0.7	-1	-50	7.8	15	6	1.9	0.4	-0.5	0.6	0.09	30.32	4	3	-5	46	-0.4	4	165	341	-0.5	-5	14	41.21	0.014	0.42	0.06	1.1	0.54	7	-2	-0.01	-2	-5	-4
RE99-74E-96-003	459519	6338652	Green clay (regolith?)	4	-5	3.9	180	1.5	24	6	44	4	2.12	2	-1	-5	3	0.07	-20	102	0.2	8.1	-3	-0.01	-0.05	-0.5	5.4	1.8	-1	153	17.8	29	10	2.6	0.5	-0.5	1.1	0.16	24.48	3	13	7	131	-0.4	16	322	221	-0.5	-5	59	26.44	0.085	0.76	0.18	4.47	1.79	11	-2	-0.01	-2	-5	-4
RE99-74E-96-004	459519	6338652	Sideritized Moberley Memb.	-2	-5	2.1	130	-0.5	2	18	27	2	33.3	-1	-1	-5	-1	0.03	-25	27	-0.1	10.3	-3	-0.01	-0.05	-0.5	2.1	1.6	-1	134	10.5	19	7	2.1	0.5	-0.5	1.6	0.24	46.1	-2	5	5	106	-0.4	16	8294	38	-0.5	-5	38	1.93	0.04	0.58	0.07	1.74	0.64	34	2	0.11	-2	-5	-4
RE99-74E-96-005	459519	6338652	Clay/bentonite	4	-5	4.5	460	-0.5	-1	14	105	9	2.45	7	-1	-5	-1	0.09	-22	192	0.6	15.8	-3	-0.01	-0.05	1	15.4	3.2	-1	101	47.6	78	33	9.2	1.7	1.2	4.6	0.69	23.94	-2	25	32	68	-0.4	22	109	94	-0.5	-5	128	0.04	0.033	0.78	0.45	8.91	3.47	40	2	0.09	-2	-5	-4
RE99-74E-96-006	459519	6338652	Bentonite	-2	-5	4.5	470	-0.5	-1	12	105	9	2.22	7	-1	-5	-1	0.09	-21	189	0.5	15.6	-3	-0.01	-0.05	0.9	14.7	3.1	-1	95	47.5	75	35	8.7	1.8	1.3	4.5	0.68	24.03	-2	24	31	61	-0.4	20	85	92	-0.5	-5	131	0.04	0.031	0.77	0.46	8.69	3.4	40	2	0.13	-2	-5	-4
RE99-74E-96-007	459519	6338652	McMurray Fm.	-2	-5	2.2	55	-0.5	-1	2	33	-1	0.63	4	-1	-5	2	0.01	-20	-15	-0.1	2.4	-3	-0.01	-0.05	0.8	4.2	1	-1	-50	17.1	29	9	1.6	0.3	-0.5	0.5	0.08	27.26	2	2	12	11	-0.4	27	71	31	-0.5	-5	53	0.03	0.012	0.02	0.09	4.09	0.06	2	-2	0.46	-2	-5	-4
RE99-74E-96-008	459519	6338652	Sideritized Moberley Memb.	-2	-5	5.3	180	-0.5	2	8	26	2	34	-1	-1	-5	-1	0.05	-23	45	0.2	5.1	-3	-0.01	-0.05	-0.5	2.2	0.8	-1	59	8.8	13	-5	1.2	0.3	-0.5	0.7	0.11	45.18	-2	5	-5	37	-0.4	13	5237	58	-0.5	-5	29	1.65	0.097	1.05	0.07	1.9	0.76	12	-2	0.15	-2	-5	-4
RE99-74E-96-009	459519	6338652	Green clay (regolith?)	-2	-5	12.1	370	-0.5	2	24	92	7	4.37	5	-1	-5	-1	0.1	71	167	0.7	12.9	-3	-0.01	-0.05	0.9	11.2	3.9	-1	86	34.5	58	19	4.7	0.8	0.7	2.3	0.35	24.56	-2	29	27	79	-0.4	63	592	217	-0.5	-5	103	3.05	0.061	1.07	0.35	7.9	3.26	17	2	0.06	2	-5	-4
RE99-74E-96-010	459519	6338652	Moberley Memb.	-2	-5	2	110	2.7	27	5	21	2	1.91	1	-1	-5	2	0.04	-20	37	0.2	3.7	-3	-0.01	-0.05	-0.5	2.7	1.2	-1	-50	9.5	16	7	1.5	0.3	-0.5	0.7	0.11	30.21	3	6	-5	62	-0.4	11	324	400	-0.5	-5	23	31.04	0.024	2.76	0.09	1.7	0.84	6	-2	0.19	2	-5	-4
RE99-74E-96-011	459519	6338652	Moberley Memb.	-2	-5	2.6	120	3.2	33	5	22	2	1.11	2	-1	-5	4	0.03	-20	40	0.1	3.8	-3	-0.01	-0.05	-0.5	2.6	1.2	-1	60	9.5	17	5	1.6	0.3	-0.5	0.8	0.12	28.93	4	7	5	83	-0.4	9	202	369	-0.5	-5	26	37.32	0.067	0.53	0.09	1.72	0.84	6	-2	0.18	2	-5	-4
RE99-74E-96-012	459519	6338652	Moberley Memb.	-2	-5	5.4	150	3.4	28	6	33	3	1.48	2	-1	-5	3	0.06	-20	51	0.3	5.6	-3	-0.01	-0.05	-0.5	3.8	2	-1	-50	13	21	8	2.1	0.4	-0.5	1.2	0.18	29.34	3	8	8	55	-0.4	10	235	427	-0.5	-5	34	31.27	0.099	0.55	0.12	2.37	1.1	12	-2	-0.01	2	-5	-4
RE99-74E-96-013	459519	6338652	Sideritized Moberley Memb.	-2	-5	2.3	150	-0.5	2	21	31	2	32.3	1	-1	-5	-1	0.04	36	45	-0.1	11.8	-3	-0.01	-0.05	-0.5	2.6	1.5	-1	109	11.7	21	9	3.2	0.8	0.8	2.9	0.44	41.03	-2	5	10	86	-0.4	36	3360	167	-0.5	-5	48	2.21	0.072	0.89	0.08	1.69	0.7	52	2	0.05	2	-5	-4
RE99-74E-96-014	459519	6338652	Green clay (regolith?)	-2	-5	16.7	440	-0.5	-1	32	87	7	4.16	6	-1	-5	-1	0.12	68	169	0.6	15.3	-3	-0.01	-0.05	-0.5	10.7	4.2	-1	97	39.7	63	24	6.9	1.4	-0.5	2.8	0.42	24.91	-2	34	40	94	-0.4	69	368	494	-0.5	-5	123	0.58	0.121	1.1	0.39	8.13	3.37	25	2	0.04	4	-5	-4
RE99-74E-96-015	459519	6338652	Green clay (regolith?)	-2	-5	3.3	480	-0.5	-1	38	97	11	4.51	4	-1	-5	-1	0.21	55	204	0.7	18.3	-3	-0.01	-0.05	1.1	12.4	2.9	-1	81	48.5	73	35	8.6	1.5	1	3.5	0.51	24.1	-2	33	21	48	-0.4	51	224	185	-0.5	-5	146	0.21	0.033	1.44	0.41	10.13	4.21	25	3	0.06	2	-5	-4
RE99-74E-96-016	459519	6338652	McMurray Fm.	-2	-5	3.5	80	3.1	-1	6	57	-1	0.64	7	-1	-5	4	0.05	50	19	0.3	8.6	-3	-0.01	-0.05	1.7	7.3	3.9	-1	-50	35.3	48	13	2.9	0.5	-0.5	1.1	0.14	26	4	5	29	16	-0.4	55	31	67	-0.5	-5	127	0.08	0.019	0.09	0.24	8.29	0.2	5	-2	0.74	-2	-5	-4
RE99-74E-96-017(O)	459519	6338652	Sulphid nodlues in McMurray Fm	-2	-5	16.1	-50	-0.5	-1	5	111	-1	11.06	5	-1	-5	1	0.02	-20	-15	0.4	3.2	-3	-0.01	-0.05	-0.5	3.5	1.7	1	-50	3.9	8	-5	1	0.3	-0.5	0.7	0.11	41.6	-2	3	8	7	-0.4	19	64	18	-0.5	-5	9	0.08	0.004	0.03	0.08	0.83	0.35	4	-2	14.33	6	-5	-4
RE99-74E-96-018(O)	459519	6338652	McMurray Fm.	-2	-5	0.9	-50	-0.5	-1	-1	17	-1	0.18	5	-1	-5	2	-0.01	-20	-15	0.2	6.2	-3	-0.01	-0.05	-0.5	8.3	2	-1	-50	7	16	6	2.1	0.4	-0.5	0.8	0.12	38.73	-2	3	7	7	-0.4	33	17	13	-0.5	-5	22	0.07	0.005	0.02	0.09	0.15	0.01	2	-2	4.09	3	-5	-4
RE99-74E-96-019	459519	6338652	McMurray Fm.	-2	-5	2.2	100	-0.5	-1	2	61	-1	0.32	18	-1	-5	-1	0.02	-20	19	0.5	12.2	-3	-0.01	-0.05	1.5	9	4.6	-1	-50	15.5	27	8	3.1	0.6	0.5	2.5	0.34	36.57	-2	11	15	11	-0.4	22	20	40	-0.5	-5	94	0.04	0.009	0.05	0.52	5.46	0.1	8	-2	0.03	-2	-5	-4
RE99-74E-96-020	459519	6338652	McMurray Fm.	-2	-5	1.4	65	-0.5	-1	2	50	1	0.31	18	-1	-5	-1	0.02	-20	15	0.3	9	-3	-0.01	-0.05	1.6	8.4	3.4	-1	-50	15.9	27	9	2	0.5	-0.5	2.2	0.33	36.72	-2	8	17	4	-0.4	17	17	27	-0.5	-5	65	0.02	0.011	0.04	0.43	4.25	0.09	6	-2	0.03	-2	-5	-4
RE99-74E-96-021	459519	6338652	McMurray Fm.	-2	-5	4.6	610	-0.5	-1	2	37	-1	0.74	9	-1	-5	3	0.02	-20	-15	0.3	6.2	-3	-0.01	-0.05	1.2	16.4	2.6	-1	-50	97.8	197	123	26.1	5.7	3.1	1.5	0.23	28.86	3	2	35	9	-0.4	26	54	534	-0.5	-5	82	0.09	0.186	0.03	0.22	5.3	0.1	23	-2	0.41	-2	-5	-4
RE99-74E-96-022	459519	6338652	McMurray Fm.	-2	-5	2.7	100	-0.5	-1	1	58	-1	0.41	20	-1	-5	-1	0.02	-20	-15	0.2	7.9	-3	-0.01	-0.05	1.3	7	3.1	-1	-50	20.7	34	11	2.5	0.5	-0.5	1.8	0.26	34.89	-2	2	17	3	-0.4	11	32	36	-0.5	-5	72	0.02	0.014	0.05	0.35	3.46	0.18	6	-2	0.1	-2	-5	-4
RE99-74E-96-023	459519	6338652	McMurray Fm.	-2	-5	2.4	-50	-0.5	-1	-1	15	-1	0.23	16	-1	-5	1	-0.01	-20	-15	0.1	2.8	-3	-0.01	-0.05	0.9	2.8	1.6	-1	-50	2	4	-5	0.5	-0.2	-0.5	1.3	0.18	26.77	3	5	-5	2	-0.4	13	24	19	-0.5	-5	42	0.02	0.003	0.01	0.17	0.1	0.01	4	-2	0.52	-2	-5	-4
RE99-74E-96-024	459519	6338652	Bentonite	-2	-5	1.8	190	-0.5	-1	2	83	2	0.6	12	-1	-5	-1	0.04	-20	46	-0.1	9.1	-3	-0.01	-0.05	1.9	7.6	3.2	-1	-50	23.2	33	10	2.4	0.5	-0.5	1.9	0.28	26.56	-2	5	18	11	-0.4	18	31	41	-0.5	-5	131	0.02	0.01	0.15	0.43	10.67	0.7	7	-2	0.01	-2	-5	-4
RE99-74E-96-025	459519	6338652	McMurray Fm.	-2	-5	2.3	73	-0.5	-1	1	42	-1	0.29	17	-1	-5	-1	0.01	-20	-15	0.3	5.2	-3	-0.01	-0.05	1.5	6.4	3	-1	-50	11.9	20	-5	1.6	0.3	-0.5	1.9	0.26	30.81	3	2	11	4	-0.4	19	19	17	-0.5	-5	77	0.01	0.008	0.03	0.36	2.33	0.12	5	-2	0.34	-2	-5	-4
RE99-74E-96-026	459519	6338652	Float: sulphide nodules	4	-5	17.6	170	-0.5	-1	7	14	1	17.2	2	-1	-5	4	0.01	-20	-15	0.5	0.8	-3	-0.01	-0.05	-0.5	3.1	-0.5	-1	-50	23.6	45	16	3.7	0.9	1	0.4	0.06	41.14	2	5	5	4	-0.4	15	12	22	-0.5	-5	53	0.03	0.003	0.01	0.14	0.2	0.01	6	-2	0.06	-2	-5	-4
RE99-74E-96-029	459519	6338652	Green clay (regolith?)	-2	-5	43.4	340	-0.5	-1	35	90	8	6.73	4	-1	-5	-1	0.11	152	179	0.9	13.5	-3	-0.01	-0.05	0.9	10.7	2.8	-1	77	33.1	54	18	4.8	0.9	0.6	2.1	0.31	25.21	-2	32	24	63	-0.4	126	1093	139	-0.5	-5	115	0.67	0.058	1.42	0.34	8.75	3.57	18	3	0.08	7	-5	-4
RE99-74E-96-030	459519	6338652	Green clay (regolith?)	-2	-5	8	450	-0.5	-1	28	89	6	2.1	6	-1	-5	-1	0.09	51	136	0.6	13.6	-3	-0.01	-0.05	0.9	11.8	4	-1	99	46.4	73	39	11.7	2.3	1.6	3.5	0.51	24.33	-2	31	38	79	-0.4	42	241	140	-0.5	-5	119	0.36	0.036	0.93	0.42	8.15	3.39	37	2	0.05	4	-5	-4
RE99-74E-96-REF1	459519	6338652	Sideritized Moberley Memb.	-2	-5	1.2	150	-0.5	2	12	26	2	31.6	1	-1	-5	-1	0.03	-20	50	-0.1	9	-3	-0.01	-0.05	-0.5	2.5	1.8	-1	140	11.4	19	6	2	0.4	-0.5	1.4	0.21	40.11	-2	5	7	100	-0.4	12	6017	51	-0.5	-5	34	1.77	0.054	0.73	0.08	2.1	0.79	26	2	0.11	3	-5	-4
RE99-74E-96-REF2	459519	6338652	Sideritized Moberley Memb.	-2	-5	2.4	140	-0.5	1	6	19	1	33.9	2	-1	-5	-1	0.03	-24	39	0.2	7.8	-3	-0.01	-0.05	-0.5	2.7	0.9	-1	-50	8.6	13	6	1.5	0.4	-0.5	2.6	0.39	43.3	-2	3	7	14	-0.4	6	3675	62	-0.5	-5	31	0.66	0.087	0.27	0.08	1.91	0.33	29	-2	0.05	3	-5	-4
RE99-74E-96-REF3	459519	6338652	McMurray Fm.	-2	-5	1	-50	-0.5	-1	1	28	-1	0.29	11	-1	-5	-1	0.01	-20	-15	-0.1	4.9	-3	-0.01	-0.05	0.8	5.6	2.5	-1	-50	13.7	21	7	1.5	0.3	-0.5	1.2	0.18	33.13	-2	3	12	7	-0.4	13	59	24	-0.5	-5	41	0.17	0.01	0.04	0.23	1.82	0.06	5	-2	0.17	-2	-5	-4
RE99-74E-97-001	466280	6372687	McMurray Fm.	-2	-5	1.2	97	-0.5	-1	1	30	1	1.13	15	-1	-5	-1	0.02	-20	24	0.2	3	-3	-0.01	-0.05	-0.5	3.5	1.5	-1	-50	8.7	13	-5	1	0.2	-0.5	1.1	0.18	34.16	-2	6	7	3	-0.4	12	16	15	-0.5	-5	44	0.03	0.009	0.08	0.16	1	0.28	2	-2	0.42	-2	-5	-4
RE99-74E-97-002	466280	6372687	Concretion in McMurray Fm.	-2	-5	2.9	230	-0.5	9	5	19	1	1.01	6	-1	-5	-1	0.05	-20	24	0.3	11.5	-3	-0.01	-0.05	-0.5	3.8	1.2	-1	-50	16	29	11	2.8	0.6	-0.5	1.6	0.24	31.07	2	3	-5	42	-0.4	11	2673	292	-0.5	-5	30	10	0.011	1.04	0.13	1.68	0.51	14	-2	0.36	-2	-5	-4
RE99-74E-97-003	466280	6372687	Float: Concretion in Moberley Memb.	-2	-5	3.5	370	-0.5	16	7	29	2	2.07	5	-1	-5	-1	0.05	-20	37	0.2	15.5	-3	-0.01	0.05	0.6	4.9	1.6	-1	-50	22.7	42	16	3.8	0.8	0.9	2	0.3	34	-2	2	13	5	-0.4	67	29	134	-0.5	-5	6	0.02	0.038	0.01	0.04	0.65	0.02	7	-2	10.89	2	-5	13
RE99-74E-99-001	464072	6332450	Float: highly altered McMurray Fm.	-2	-5	-0.5	110	-0.5	-1	7	52	-1	22.9	4	-1	-5	-1	-0.01	-21	23	0.1	17.7	-3	-0.01	-0.05	0.7	3.9	3.2	-1	146	12.2	19	-5	1.2	0.2	-0.5	2.6	0.44	34.36	-2	2	16	97	-0.4	8	889	56	-0.5	-5	161	0.18	0.116	0.17	0.11	2.58	0.09	17	2	0.03	2	-5	-4
RE99-74E-99-002	464072	6332450	Float: highly altered McMurray Fm.	-2	-5	7.6	2200	-0.5	1	18	15	-1	30.2	2	-1	-5	-1	0.02	-22	-15	0.3	4.7	-3	-0.01	0.26	-0.5	2.2	3.3	-1	103	7.5	15	5	1.6	0.3	-0.5	0.8	0.11	33.44	-2	2	18	78	-0.4	13	879	2477	-0.5	-5	45	0.99	0.571	0.31	0.02	2.4	0.04	6	-2	0.05	-2	-5	-4
RE99-74E-99-003	464072	6332450	Float: sulphide nodules	-2	-5	31.7	120	-0.5	-1	3	12	-1	23.2	3	1	-5	-1	0.02	-20	21	0.3	0.6	-3	-0.01	-0.05	-0.5	2.5	-0.5	-1	-50	7.7	13	-5	1	-0.2	-0.5	0.5	0.07	45.83	-2	5	6	51	-0.4	11	3757	408	-0.5	-5	34	14.91	0.019	1.43	0.14	2.27	0.57	19	-2	0.53	2	-5	-4
RE99-74E-99-004	464072	6332450	Float: botryoidal goethite	-2	-5	4.3	190	-0.5	2	30	28	2	40.8	-1	-1	-5	1	0.03	-24	57	-0.1	4.6	-3	-0.01	-0.05	-0.5	2.4	1.9	-1	180	9.3	15	-5	1.4	0.3	-0.5	1	0.17	36.07	-2	5	6	124	-0.4	10	4288	52	-0.5	-5	28	1.07	0.064	0.54	0.07	1.92	0.83	17	-2	0.1	-2	-5	-4
RE99-74E-99-005	464072	6332450	Float: green clay	-2	-5	1.9	200	-0.5	-1	8	73	-1	20	7	-1	-5	-1	0.02	-23	-15	0.4	20.2	-3	-0.01	-0.05	1	5.2	4.1	-1	186	14.1	22	6	1.3	0.3	-0.5	2.7	0.41	28.82	-2	3	14	139	-0.4	12	893	54	-0.5	-5	197	0.21	0.09	0.18	0.14	4.73	0.2	16	3	0.08	-2	-5	-4
RE99-DUP1			RE99-74E-13-006	-2	-5	2.5	170	5.6	-1	4	62	1	0.67	10	-1	-5	-1	0.3	-41	-15	0.6	15.3	-3	-0.01	-0.05	1.7	16.4	6.9	4	-50	45	72	23	5.1	1.1	0.6	3.6	0.54	25.9	3	8	47	15	0.5	17	19	181	-0.5	-5	69	0.21	0.01	0.2	0.85	6.1	0.18	18	2	0.14	-2	-5	-4
RE99-DUP2			RE99-74E-85-010	-2	-5	3.9	190	-0.5	-1	3	31	1	9.95	12	-1	-5	-1	0.06	-20	27	0.2	3	-3	-0.01	-0.05	0.6	5.5	1.6	-1	-50	18.3	33	12	2.7	0.5	-0.5	1.7	0.26	34.79	-2	4	9	11	-0.4	7	41	33	-0.5	-5	20	0.11	0.008	0.05	0.14	1.39	0.47	5	-2	6.45	-2	-5	-4
RE99-DUP3			RE99-74E-96-003	-2	-5	1.4	400	2.1	23	6	59	6	2.16	2	-1	-5	-1	0.06	-20	91	0.2	8.4	-3	-0.01	-0.05	0.5	7.3	1.8	-1	153	19.2	37	15	2.9	0.6	-0.5	1.1	0.17	26.82	2	13	6	134	-0.4	15	307	208	-0.5	-5	61	25.25	0.083	0.81	0.18	4.35	1.93	10	-2	0.13	-2	-5	-4
RE99-DUP4			RE99-74E-96-013	-2	-5	2.3	150	-0.5	4	22	34	2	36.1	1	-1	-5	-1	0.03	-20	-15	0.1	12.5	-3	-0.01	-0.05	-0.5	3.2	2	-1	84	13.6	30	13	3.3	1	1	3.1	0.45	45.48	-2	6	12	85	-0.4	37	3537	160	-0.5	-5	46	2.17	0.073	0.87	0.08	1.64	0.68	54	2	0.08	-2	-5	-4
RE99-DUP5			RE99-74E-96-025	-2	-5	1.6	80	-0.5	-1	-1	60	-1	0.28	-1	-1	-5	-1	0.02	-30	-15	0.3	5.6	-3	-0.01	-0.05	1.6	10.1	3.3	-1	-50	14.5	30	9	1.9	0.4	-0.5	2	0.3	30.63	2	2	30	5	-0.4	17	15	17	-0.5	-5	68	0.01	0.008	0.03	0.32	2.55	0.11	5	-2	0.32	-2	-5	-4
RE99-DUP6			RE99074E-99-004	-2	-5	3.1	380	-0.5	2	28	39	2	42.1	-1	-1	-5	-1	0.03	-20	53	-0.1	4.2	-3	-0.01	-0.05	-0.5	3	1.2	-1	144	9.6	16	-5	1.4	0.4	-0.5	1.1	0.16	37.11	-2	5	16	116	-0.4	11	4316	53	-0.5	-5	27	1.14	0.071	0.55	0.07	1.93	0.82	18	-2	0.13	-2	-5	-4

Appendix 3a. 1999 Stream Sediment Sample Geochemistry

Appendix 3a. 1999 stream sediment sample descriptions.

Sample Number and Date	GPS Location	Rock Type	Weather	Water Velocity	Vegetation	Relief	Contamination	Stream Bottom	Sample Area (m^2)	Sample Depth	Sediment Colour	Sediment Composition	Duplicate Sample Taken	Sample for Orientation
RE99-74E-07-002 19-Jun-99	481050 6348900	N/A	Clear	Slow	Mixed	Medium	Upstream from bridge	Sand	1	1-5 cm	Sandy	Sand	N/A	N/A
RE99-74E-09-002 19-Jun-99	495475 6346826	N/A	Clear	Slow	Alder	Low	Upstream from bridge	Sand	0.5	1-3 cm	Sandy	Sand	N/A	N/A
RE99-74E-10-002 21-Jun-99	449075 6319655	N/A	Cloudy	Medium	Deciduous	High	N/A	Rock	1	1-3 cm	Sandy	Sand	N/A	N/A
RE99-74E-11-002 21-Jun-99	453327 6328024	Oil Sands	Cloudy	Fast	Mixed	High	Close to bank edge	Sand	1	1-5 cm	Black Sandy	Sand	N/A	N/A
RE99-74E-13-002 21-Jun-99	458730 6340669	Sedimentary	Cloudy	Slow	Mixed	High	N/A	Sand	1	15-20cm	Grey Brown	Fines	N/A	N/A
RE99-74E-14-002 21-Jun-99	453311 6336186	Oil Sands	Cloudy	Medium	Mixed	High	Close to Section	Sand	1	1-3 cm	Black	Sand	N/A	N/A
RE99-74E-16-002 21-Jun-99	441457 6342900	N/A	Cloudy	Medium	Mixed	Low	N/A	Sand	1	1-3 cm	Brown Grey	Sand	N/A	N/A
RE99-74E-17-002 21-Jun-99	453283 6343452	Oil Sands	Cloudy	Medium	Mixed	Medium	N/A	Sand Clay	3	1-3 cm	Black Brown Grey	Sand Fines	N/A	N/A
RE99-74E-18-002 21-Jun-99	457329 6349070	Oil Sands	Clear	Medium	Deciduous	Medium	N/A	Clay	10	1-5 cm	Brown Grey	Fines	Yes	Yes
RE99-74E-20-002 21-Jun-99	456608 6355565	N/A	Cloudy	Medium	Deciduous	Low	Beaver Dam	Sand Clay	1	15-20cm	Grey Black	Fines Organic	N/A	N/A
RE99-74E-21-002 21-Jun-99	443825 6359678	Shale	Cloudy	Medium	Mixed	Low	N/A	Sand Clay	5	1-3 cm	Grey Brown	Fines	N/A	N/A
RE99-74E-23-002 22-Jun-99	442949 6372897	Shaftesbury	Cloudy	Fast	Mixed	High	Slumping	Sand Clay	4	1-3 cm	Grey Brown	Sand Fines	N/A	N/A
RE99-74E-27-002 22-Jun-99	479029 6401348	Oil Sands	Cloudy	Medium	Deciduous	High	Close to Section of Oil Sands	Sand	10	1-5 cm	Brown Black	Sand	Yes	Yes
RE99-74E-28-002 22-Jun-99	489425 6387448	N/A	Cloudy	Medium	Mixed	Low	N/A	Sand	2	1-5 cm	Grey Brown	Fines	N/A	N/A
RE99-74E-29-002 22-Jun-99	494146 6383198	N/A	Cloudy	Fast	Mixed	Medium	N/A	Sand	1	1-3 cm	Brown	Sand Fines	N/A	N/A
RE99-74E-30-002 22-Jun-99	494210 6383198	N/A	Cloudy	Medium	Mixed	Medium	N/A	Sand Clay	2	1-3 cm	Brown sand and Grey clay	Sand Fines	N/A	N/A
RE99-74E-32-002 24-Jun-99	493974 6375081	Glacial/ Fluvial?	Clear	Fast	Deciduous	Low	N/A	Sand	2	1-3 cm	Brown Sandy	Sand	N/A	N/A
RE99-74E-35-002 24-Jun-99	502155 6369397	Oil Sands	Clear	Fast	Mixed	Medium	N/A	Sand	2	1-5 cm	Grey Brown	Fines	N/A	N/A
RE99-74E-37-002 24-Jun-99	507737 6350143	N/A	Cloudy	Slow	Grass	Low	N/A	Sand Clay Organic	1	1-3 cm	Brown Grey	Fines	N/A	N/A
RE99-74E-38-002 24-Jun-99	501463 6357561	N/A	Cloudy	Fast	Spruce	Low	N/A	Sand Clay	1	1-5 cm	Brown Black	Fines	N/A	N/A
RE99-74E-39-002 24-Jun-99	509520 6363072	N/A	Cloudy	Medium	Spruce	Low	N/A	Sand	1	1-3 cm	Brown	Sand	N/A	N/A
RE99-74E-40-002 24-Jun-99	499618 6386317	Glacial/ Fluvial	Clear	Slow	Spruce	Medium	N/A	Sand	10	1-3 cm	Sand	Sand	Yes	Yes 4 bags
RE99-74E-44-002 24-Jun-99	465353 6372559	Oil Sands	Cloudy	Medium	Spruce	Medium	N/A	Sand Clay	1	1-3 cm	Brown	Sand Fines	N/A	N/A
RE99-74E-45-002 25-Jun-99	452075 6382222	Shaftesbury	Cloudy	Medium	Deciduous	Medium	N/A	Clay	2	1-5 cm	Brown Grey	Fines	N/A	N/A
RE99-74E-46-002 25-Jun-99	452779 6387970	N/A	Cloudy	Fast	Deciduous	Medium	N/A	Clay	5	1-3 cm	Brown	Fines	N/A	N/A
RE99-74E-47-002 25-Jun-99	468937 6390666	N/A	Cloudy	Medium	Mixed	Low	N/A	Sand	3	1-3 cm	Brown	Sand	N/A	N/A
RE99-74E-48-002 25-Jun-99	445973 6413507	N/A	Cloudy	Fast	Mixed	High	N/A	Sand Clay	15	2-5 cm	Brown Black	Sand Fines	Yes	Yes 4 bags
RE99-74E-51-002 25-Jun-99	477493 6419311	Sand Dunes	Cloudy	Slow	Spruce	Low	N/A	Sand	1	1-3 cm	Sand	Sand	N/A	N/A
RE99-74E-53-002 25-Jun-99	493813 6416060	Sand Dunes	Cloudy	Medium	Mixed	Low	N/A	Sand	1	1-3 cm	Sand	Sand	N/A	N/A
RE99-74E-55-002 26-Jun-99	487120 6321336	N/A	Cloudy	Medium	Spruce	Medium	N/A	Sand	3	1-3 cm	Brown	Sand	N/A	N/A
RE99-74E-56-002 26-Jun-99	486675 6325537	N/A	Cloudy	Medium	Mixed	Medium	N/A	Sand	1	1-3 cm	Brown	Coarse	N/A	N/A
RE99-74E-57-002 26-Jun-99	491232 6332027	N/A	Cloudy	Medium	Spruce	Low	N/A	Sand	2	1-3 cm	Brown	Sand	N/A	N/A

Appendix 3a. 1999 stream sediment sample descriptions.

RE99-74E-58-002 26-Jun-99	493277 6342553	N/A	Clear	Medium	Mixed	Low	N/A	Sand Clay	2	10-20cm	Brown	Sand Fines	N/A	N/A
RE99-74E-60-002 26-Jun-99	523797 6318074	N/A	Cloudy	Slow	Mixed	Low	Fallen Trees --large group	Sand Clay	2	10 cm	Brown	Sand	N/A	N/A
RE99-74E-61-002 26-Jun-99	527723 6325551	N/A	Cloudy	Slow	Muskeg Grass	Low	N/A	Sand	3	5 - 30cm	Brown	Sand Fines	N/A	N/A
RE99-74E-62-002 9-Jul-99	513717 6423701	Sand	Clear	Medium	Spruce	Medium	N/A	Rock	0.5	3-5 cm	Black	Fines Organics	N/A	N/A
RE99-74E-63-002 9-Jul-99	514794 6421049	Glacial/ Fluvial	Clear	Medium	Spruce	Medium	N/A	Sand	2	1-3 cm	Brown	Sand	N/A	N/A
RE99-74E-65-002 9-Jul-99	533549 6408354	Granite	Clear	Fast	Spruce	Medium	N/A	Sand	3	1-3 cm	Brown	Sand Fines	N/A	N/A
RE99-74E-66-002 9-Jul-99	543129 6409497	N/A	Clear	Medium	Spruce	Low	N/A	Sand	3	1-3 cm	Brown	Sand	N/A	N/A
RE99-74E-67-002 9-Jul-99	542849 6427910	N/A	Clear	Slow	Spruce Fire Area	Low	Fire Area	Sand	10	5-20cm	Brown	Sand	Yes	Yes 4 bags
RE99-74E-70-002 9-Jul-99	557510 6424654	Granite	Clear	Inert	Spruce		At edge of deep pool	Sand > Clay > Organic	1	4-8 cm	Brown	Fines Organic	N/A	N/A
RE99-74E-71-002 9-Jul-99	556430 6409378	N/A	Clear	Slow	Mixed	Low	N/A	Sand and minor clay	5	30 cm	Brown	Sand Fines	N/A	N/A
RE99-74E-72-002 9-Jul-99	555471 6402773	N/A	Clear	Fast	Spruce	Low	N/A	Sand	2	2-10cm	Brown	Sand	N/A	N/A
RE99-74E-73-002 9-Jul-99	542502 6392416	N/A	Clear	Medium	Spruce	Low	N/A	Sand	2	3 - 6cm	Brown	Sand	N/A	N/A
RE99-74E-74-002 9-Jul-99	548549 6383669	N/A	Clear	Slow	Spruce	High	N/A	Clay	1	3-10 cm	Brown	Fines	N/A	N/A
RE99-74E-75-002 10-Jul-99	534861 6329498	N/A	Clear	Slow	Mixed	Low	N/A	Sand	2	1-2 cm	Brown	Sand Fines	N/A	N/A
RE99-74E-76-002 10-Jul-99	543099 6325027	N/A	Clear	Slow	Spruce	Low	N/A	Sand	0.5	2-4 cm	Brown	Sand	N/A	N/A
RE99-74E-77-002 10-Jul-99	556750 6318900	N/A	Clear	Slow	Spruce	Low	N/A	Sand	2	1-2 cm	Brown	Sand	N/A	N/A
RE99-74E-78-002 10-Jul-99	552370 6330600	N/A	Clear	Medium	Spruce	Low	Swampy	Rock	0.5	2-5 cm	Rusty Brown	Coarse	N/A	N/A
RE99-74E-79-002 10-Jul-99	553527 6333766	N/A	Clear	Slow	Spruce	Low	Swampy	Sand Organic	1	1-2 cm		Fines Organic	N/A	N/A
RE99-74E-80-002 10-Jul-99	550884 6344920	N/A	Clear	Medium	Alder Grass	Low	N/A	Sand	2	1-2 cm	Brown	Sand	N/A	N/A
RE99-74E-81-002 10-Jul-99	558526 6358626	N/A	Clear	Slow	Spruce			Clay Organic	10	1-5 cm	Brown Black	Fines	Yes	Yes 4 bags
RE99-74E-82-002 10-Jul-99	559889 6366853	N/A	Clear	Medium	Spruce	Medium	Beaver Dam	Sand	2	1-3 cm	Brown	Sand	N/A	N/A
RE99-74E-84-002 10-Jul-99	519915 6361954	N/A	Clear	Medium	Spruce	Low	N/A	Sand < Clay - Organic	1	1-3 cm	Grey Brown Black	Sand Fines	N/A	N/A
RE99-74E-86-002 11-Jul-99	491647 6356389	N/A	Cloudy	Slow	Mixed	Low	N/A	Sand Rock	1	3 cm	Brown Grey	Sand Fines	N/A	N/A
RE99-74E-87-002 11-Jul-99	521768 6355819	N/A	Cloudy	Slow	Mixed	Low	N/A	Sand Clay	3	5 m	Brown Grey Black	Sand	N/A	N/A
RE99-74E-88-002 11-Jul-99	517625 6366955	N/A	Cloudy	Slow	Spruce	Low	N/A	Sand	3	1-3 cm	Brown	Sand	N/A	N/A
RE99-74E-89-002 11-Jul-99	502668 6384908	N/A	Cloudy	Medium	Spruce	Low	N/A	Sand	2	1-3 cm	Brown	Sand	N/A	N/A
RE99-74E-90-002 11-Jul-99	517602 6385265	N/A	Cloudy Rain	Fast	Spruce	Medium	N/A	Rock	3	3-6 cm	Brown minor red, white, etc Granular	Coarse 90% Sand 10%	N/A	N/A
RE99-74E-91-002 11-Jul-99	525595 6379788	N/A	Cloudy Rain	Fast	Spruce	Low	N/A	Rock	3	1-3 cm	Brown	Sand	N/A	N/A
RE99-74E-92-002 11-Jul-99	532118 6378004	N/A	Cloudy Rain	Slow	Spruce	Low	N/A	Sand	2	1-3 cm	Brown	Sand	N/A	N/A
RE99-74E-93-002 11-Jul-99	556860 6383129	Glacial/ Fluvial	Cloudy Rain	Fast	Spruce	High	N/A	Rock	3	1-3 cm	Brown	Sand	N/A	N/A
RE99-74E-94-002 11-Jul-99	540945 6370215	N/A	Cloudy	Medium	Spruce	Low	N/A	Sand	2	1-3 cm	Brown	Sand	N/A	N/A

Appendix 3b. 1999 Stream Sediment Sample Geochemistry

Appendix 3b. 1999 stream sediment sample geochemistry.

			AU	AG	AS	BA	BR	CA	CO	CR	CS	FE	HF	HG	IR	MO	NA	NI	RB	SB	SC	SE	SN	SR	TA	TH	U	W	ZN	LA	CE	ND	SM	EU	TB	YB	LU	Mass	MO	CU	PB	ZN	AG	NI	MN	SR	CD	BI	V	CA	P	MG	TI	AL	K	Y	BE	S	Pd	Pt	Au
Sample ID	Easting	Northing	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	INNA	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	F.A.	F.A.	F.A.
			ppb	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	%	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	g	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	%	%	%	%	%	ppm	ppm	%	ppb	ppb	ppb
Detection Limit -->			2	5	0.5	50	0.5	1	1	5	1	0.01	1	1	5	1	0.01	20	15	0.1	0.1	3	0.01	0.05	0.5	0.2	0.5	1	50	0.5	3	5	0.1	0.2	0.5	0.2	0.05	0	2	1	5	1	0.4	1	1	1	0.5	5	2	0.01	0	0.01	0.01	0.01	0.01	2	2	0.01			
RE99-74E-018-001(45-80)	457329	6349070	-2	-5	5.3	310	2.5	1	5	25	1	1.2	6	-1	-5	-1	0.25	-20	27	0.3	3.4	-3	-0.01	-0.05	-0.5	4.1	1.2	-1	-50	17.1	30	12	2.7	0.5	-0.5	1.3	0.22	33.1	-2	5	8	21	-0.4	6	311	70	-0.5	-5	35	0.35	0.043	0.22	0.14	2.13	0.77	10	-2	0.1	0.5	-0.1	3
RE99-74E-018-001(80-120)	457329	6349070	-2	-5	4.5	310	2	-1	5	26	-1	1.06	6	-1	-5	1	0.24	-20	20	0.2	3	-3	-0.01	-0.05	-0.5	4.1	1.2	-1	-50	16.1	31	12	2.5	0.5	-0.5	1.4	0.2	36.86	-2	4	6	20	-0.4	6	257	63	-0.5	-5	33	0.3	0.033	0.2	0.13	1.89	0.69	9	-2	0.09	0.1	-0.1	3
RE99-74E-018-001(120-200)	457329	6349070	2	-5	4.7	400	2.6	-1	6	46	1	1.32	15	-1	-5	-1	0.29	-20	43	0.4	4.7	-3	-0.01	-0.05	-0.5	6.4	1.9	-1	-50	22.9	41	17	3.7	0.7	-0.5	2.3	0.3	32.94	-2	6	8	27	-0.4	11	344	67	-0.5	-5	50	0.45	0.045	0.33	0.24	2.61	0.91	11	-2	0.12	0.3	-0.1	2
RE99-74E-018-001(<200)	457329	6349070	2	-5	7.3	440	4.7	-1	7	78	2	1.93	33	-1	-5	2	0.29	-20	54	0.5	7.8	-3	-0.01	-0.05	0.8	9	3.8	-1	-50	33.9	70	32	5.8	1.1	0.9	4.6	0.73	27.16	-2	9	10	37	-0.4	12	453	72	-0.5	-5	60	0.64	0.055	0.49	0.31	3.45	1.08	18	-2	0.2	0.5	-0.1	7
RE99-74E-027-002(45-80)	479029	6401348	-2	-5	1.2	130	1	-1	1	-5	-1	0.25	1	-1	-5	-1	0.15	-20	18	-0.1	0.8	-3	-0.01	-0.05	-0.5	1.9	-0.5	-1	-50	7.4	13	5	1	-0.2	-0.5	0.3	0.06	46.22	-2	2	-5	4	-0.4	2	53	49	-0.5	-5	8	0.16	0.009	0.06	0.03	0.8	0.39	3	-2	0.01	0.1	-0.1	2
RE99-74E-027-002(80-120)	479029	6401348	-2	-5	1.7	170	0.9	-1	1	10	-1	0.47	3	-1	-5	-1	0.22	-20	-15	0.2	1.4	-3	-0.01	-0.05	-0.5	3.3	0.8	-1	-50	11.7	20	8	1.6	0.3	-0.5	0.6	0.09	44.35	-2	2	5	6	-0.4	2	103	56	-0.5	-5	13	0.25	0.015	0.09	0.12	1.04	0.4	6	-2	0.02	0.2	-0.1	2
RE99-74E-027-002(120-200)	479029	6401348	-2	-5	2.3	300	1.1	-1	3	55	-1	1.08	28	-1	-5	-1	0.33	-20	-15	0.2	3.8	-3	-0.01	-0.05	1.4	11.1	2	-1	-50	34.5	58	22	4.5	0.7	-0.5	2.4	0.35	42.63	-2	2	8	13	-0.4	6	301	74	-0.5	-5	32	0.62	0.039	0.25	0.36	1.54	0.53	13	-2	0.04	0.1	-0.1	1
RE99-74E-040-002(45-80)	499618	6386317	-2	-5	2.1	220	1.8	-1	2	5	-1	0.44	2	-1	-5	-1	0.18	-20	-15	0.1	1	-3	-0.01	-0.05	-0.5	2.6	0.6	-1	-50	10.1	17	6	1.4	0.3	-0.5	0.5	0.07	38.04	-2	2	-5	7	-0.4	2	91	56	-0.5	-5	9	0.17	0.017	0.07	0.04	1.1	0.55	3	-2	0.03	0.3	-0.1	2
RE99-74E-040-002(80-120)	499618	6386317	-2	-5	1.4	180	1.4	-1	1	6	-1	0.31	1	-1	-5	-1	0.19	-20	-15	0.1	1	-3	-0.01	-0.05	-0.5	2.1	0.5	-1	-50	8.6	15	6	1.2	0.2	-0.5	0.5	0.07	40.73	-2	2	-5	7	-0.4	2	71	54	-0.5	-5	9	0.18	0.014	0.07	0.06	1.04	0.43	3	-2	0.02	0.2	-0.1	2
RE99-74E-040-002(120-200)	499618	6386317	-2	-5	1.8	210	1.4	-1	2	9	-1	0.44	3	-1	-5	-1	0.25	-20	-15	0.2	1.5	-3	-0.01	-0.05	-0.5	2.8	0.6	-1	-50	11.4	21	9	1.6	0.3	-0.5	0.6	0.12	40.58	-2	2	5	8	-0.4	2	110	57	-0.5	-5	13	0.25	0.022	0.1	0.09	1.19	0.47	4	-2	0.02	0.2	-0.1	2
RE99-74E-048-002(45-80)	445973	6413507	-2	-5	2.4	190	1.2	-1	2	7	-1	0.47	2	-1	-5	-1	0.26	-20	-15	0.1	1.3	-3	-0.01	-0.05	-0.5	2	0.6	-1	-50	7.9	13	-5	1.1	-0.2	-0.5	0.4	0.08	44.95	-2	2	5	7	-0.4	2	91	59	-0.5	-5	11	0.21	0.014	0.08	0.04	1.19	0.47	4	-2	0.04	0.6	-0.1	2
RE99-74E-048-002(80-120)	445973	6413507	-2	-5	2.2	220	0.8	-1	2	9	-1	0.61	2	-1	-5	-1	0.32	-20	24	0.2	1.9	-3	-0.01	-0.05	-0.5	2.6	0.9	-1	-50	9.4	16	6	1.4	0.3	-0.5	0.6	0.1	41.29	-2	3	6	10	-0.4	2	112	71	-0.5	-5	15	0.3	0.023	0.11	0.08	1.53	0.6	6	-2	0.06	0.4	-0.1	1
RE99-74E-048-002(120-200)	445973	6413507	2	-5	3.7	310	0.8	-1	4	23	-1	1.04	12	-1	-5	1	0.42	-20	39	0.3	3.5	-3	-0.01	-0.05	-0.5	5.7	1.5	-1	-50	19	33	11	2.9	0.6	-0.5	1.6	0.26	38.95	-2	5	9	22	-0.4	6	196	83	-0.5	-5	31	0.44	0.039	0.2	0.18	2.08	0.82	11	-2	0.12	0.6	-0.1	2
RE99-74E-048-002(<200	445973	6413507	-2	-5	7.1	530	-0.5	-1	6	68	2	2.09	51	-1	-5	-1	0.59	-21	54	0.7	8.1	-3	-0.01	-0.05	-0.5	16.2	5.1	3	-50	50.5	87	38	7.7	1.4	1	5.8	0.86	35.26	-2	10	17	38	-0.4	15	360	115	-0.5	-5	61	0.8	0.079	0.43	0.36	3.44	1.25	26	-2	0.29	0.4	-0.1	2
RE99-74E-081-002(45-80)	558526	6358626	2	-5	1	160	8.8	-1	-1	-5	-1	0.26	1	-1	-5	-1	0.14	-20	-15	-0.1	0.6	-3	-0.01	-0.05	-0.5	1.4	-0.5	-1	-50	7.3	13	-5	0.9	-0.2	-0.5	0.3	0.05	32.44	-2	2	-5	5	-0.4	2	102	48	-0.5	-5	5	0.41	0.036	0.07	0.03	0.72	0.33	3	-2	0.18	0.2	-0.1	-1
RE99-74E-081-002(80-120)	558526	6358626	2	-5	1.1	120	7.8	-1	-1	-5	-1	0.25	1	-1	-5	2	0.16	-20	-15	0.1	0.6	-3	-0.01	-0.05	-0.5	1.3	-0.5	-1	-50	7.9	13	-5	1	0.2	-0.5	0.4	0.06	31.83	-2	2	-5	3	-0.4	2	62	49	-0.5	-5	3	0.26	0.021	0.05	0.03	0.76	0.35	3	-2	0.08	0.5	-0.1	2
RE99-74E-081-002(120-200)	558526	6358626	-2	-5	1.7	190	14.6	-1	2	7	-1	0.5	3	-1	-5	-1	0.22	-20	-15	0.1	1.3	-3	-0.01	-0.05	-0.5	1.9	0.6	-1	-50	8.1	15	6	1.1	0.3	-0.5	0.5	0.06	27.58	-2	2	-5	6	-0.4	2	127	52	-0.5	-5	7	0.4	0.039	0.08	0.06	0.96	0.41	4	-2	0.14	0.8	-0.1	2
RE99-74E-081-002(<200	558526	6358626	-2	-5	3.3	270	36.2	-1	2	17	-1	1.12	8	-1	-5	2	0.27	-20	-15	-0.1	2.3	-3	-0.01	-0.05	-0.5	3.8	0.8	-1	-50	12	21	-5	1.8	0.4	-0.5	1	0.18	18.62	-2	2	6	12	-0.4	6	236	58	-0.5	-5	11	0.81	0.098	0.15	0.08	1.13	0.4	6	-2	0.36	0.9	-0.1	2
RE99-74E-07-002	481050	6348900	-2	-5	0.6	100	2.1	-1	1	6	-1	0.28	4	-1	-5	-1	0.15	-20	-15	0.1	1.3	-3	-0.01	-0.05	-0.5	2.8	0.7	-1	-50	11	22	7	1.6	0.2	-0.5	0.6	0.09	29.71	-2	2	-5	2	-0.4	2	45	44	-0.5	-5	7	0.15	0.009	0.06	0.06	0.68	0.25	4	-2	0.03	0.1	-0.1	-1
RE99-74E-09-002	495475	6346826	-2	-5	5	300	3.4	-1	5	33	-1	2.05	12	-1	-5	-1	0.42	-20	39	0.2	5.9	-3	-0.01	-0.05	-0.5	8.9	-0.5	-1	-50	24.5	46	19	3.8	0.6	-0.5	1.9	0.31	14.46	-2	2	9	15	-0.4	4	252	75	-0.5	-5	27	0.67	0.04	0.3	0.17	2	0.57	10	-2	0.02	0.9	-0.1	-1
RE99-74E-10-002	449075	6319655	2	-5	9.4	500	3.2	2	9	60	2	2.8	10	-1	-5	2	0.63	-26	49	0.7	7.3	-3	-0.01	-0.05	-0.5	7.4	2.3	-1	-50	26.8	59	24	4.2	0.9	-0.5	2.4	0.36	4.857	-2	8	12	43	-0.4	13	888	120	-0.5	-5	63	1.27	0.077	0.71	0.21	3.54	1.12	14	-2	0.23	1	-0.1	2
RE99-74E-11-002	453327	6328024	4	-5	7.4	530	2.3	2	8	52	2	2.21	10	-1	-5	1	0.6	-21	49	0.5	7.2	-3	-0.01	-0.05	1.6	6.2	2	-1	52	23.5	42	17	3.9	0.8	0.7	1.9	0.26	31.95	-2	11	11	55	-0.4	19	361	135	-0.5	-5	82	1.17	0.078	0.83	0.21	4.13	1.42	15	-2	0.18	0.9	0.2	4
RE99-74E-13-002	458730	6340669	-2	-5	3.7	330	2	-1	3	20	1	1.15	5	-1	-5	-1	0.29	-20	15	0.2	2.5	-3	-0.01	-0.05	-0.5	3.2	0.9	-1	-50	13.8	28	13	2.3	0.5	-0.5	1	0.16	21.5	-2	2	5	11	-0.4	5	180	62	-0.5	-5	22	0.44	0.022	0.19	0.08	1.31	0.51	6	-2	0.1	0.3	-0.1	-1
RE99-74E-14-002	453311	6336186	-2	-5	5.6	320	2	-1	7	38	2	1.79	9	-1	-5	-1	0.23	-20	45	0.4	6.5	-3	-0.01	-0.05	-0.5	6.1	2	-1	58	22.9	42	13	3.7	0.8	-0.5	2.1	0.3	29.5	-2	10	10	39	-0.4	15	278	68	-0.5	-5	66	0.48	0.038	0.5	0.2	3.2	1.01	11	-2	0.2	0.7	-0.1	4
RE99-74E-16-002	441457	6342900	-2	-5	7.8	430	3.3	-1	7	50	2	1.96	9	-1	-5	-1	0.53	-20	48	0.5	5.5	-3	-0.01	-0.05	-0.5	7	2	-1	81	24.7	51	20	4	1	-0.5	2	0.3	5.842	-2	5	11	34	-0.4	8	400	97	-0.5	-5	51	0.76	0.058	0.51	0.2	2.91	1.09	13	-2	0.15	0.5	-0.1	-1
RE99-74E-17-002	453283	6343452	3	-5	6.5	460	1	-1	4	50	2	1.59	14	-1	-5	-1	0.56	-20	32	0.4	4.8	-3	-0.01	-0.05	1.1	5.7	2.2	-1	-50	22	40	14	3.7	0.8	0.6	2.1	0.31	34.92	-2	6	8	37	-0.4	13	234	101	-0.5	-5	53	0.91	0.07	0.61	0.2	2.97	1.13	14	-2	0.13	0.4	-0.1	3
RE99-74E-20-002	456608	6355565	-2	-5	5.5	390	1.8	-1	5	40	2	1.47	12	-1	-5	2	0.38	-20	43	0.4	4.8	-3	-0.01	-0.05	-0.5	6.5	1.5	-1	-50	22.2	40	15	3.3	0.7	-0.5	1.9	0.28	36.13	-2	6	9	32	-0.4	11	240	86	-0.5	-5	53	0.47	0.057	0.33	0.22	2.53	0.96	12	-2	0.04	0.4	-0.1	2
RE99-74E-21-002	443825	6359678	-2	-5	5.4	480	3.6	-1	6	37	2	1.48	8	-1	-5	-1	0.3	-20	49	0.4	4.9	-3	-0.01	-0.05	-0.5	5.7	1.4	-1	60	20.5	37	13	3.2	0.7	-0.5	1.7	0.21	31.33	-2	7	11	40	-0.4	11	484	84	-0.5	-5	61	0.35	0.056	0.26	0.2	2.8	0.92	13	-2	0.06	0.6	-0.1	2
RE99-74E-23-002	442949	6372897	-2	-5	22.8	1500	4.2	-1	13	87	5	3.69	11	-1	-5	5	0.4	-23	72	1.8	11.9	-3	-0.01	-0.05	1.4	10.5	4.2	-1	175	35.1	60	25	5.7	1.3	0.8	3.3	0.41	26.92	5	26	21	128	-0.4	38	326	160	1.7	-5	197	0.52	0.125	0.6	0.33	5.45	1.67	25	2	0.83	1.7	0.3	1
RE99-74E-28-002	489425	6387448	-2	-5	2.3	230	4.6	-1	3	19	-1	1.12	8	-1	-5	-1	0.29	-20	30	0.2	2.6	-3	-0.01	-0.05	-0.5	4.3	0.9	-1	-50	15.4	28	9	2.3	0.5	-0.5	1.2	0.14	32.74	-2	3	9	14	-0.4	8	419	65	-0.5	-5	20	0.81	0.051	0.38	0.12	1.67	0.64	8	-2	0.11	0.3	-0.1	2
RE99-74E-29-002	494146	6383198	2	-5	2.6	290	4.7	1	3	22	-1	1.04	10	-1	-5	-1	0.28	-20	29	0.2	3	-3	-0.01	-0.05	-0.5	5.2	1.5	-1	-50	16.7	29	11	2.5	0.5	-0.5	1.5	0.19	30.11	-2	3	7	16	-0.4	6	349	66	-0.5	-5	22	1	0.05	0.48	0.13	1.74	0.64	9	-2	0.15	0.5	-0.1	1
RE99-74E-30-002	494210	6383198	2	-5	1.6	150	2.7	-1	2	15	-1	0.62	7	-1	-5	-1	0.24	-20	-15	0.2	1.9	-3	-0.01	-0.05	-0.5	3.3	0.8	-1	-50	13.1	23	8	1.9	0.4	-0.5	1	0.16	39.36	-2	2	-5	9	-0.4	4	241	58	-0.5	-5	16	0.32	0.026	0.15	0.1	1.27	0.51	7	-2	0.03	0.2	-0.1	2
RE99-74E-32-002	493974	6375081	-2	-5	1.5	160	2.2	-1	2	19	-1	0.86	11	-1	-5	-1	0.18	-20	-15	0.1	2.6	-3	-0.01	-0.05	-0.5	6	1.1	-1	-50	18	33	10	2.5	0.4	-0.5	1.3	0.21	29.7	-2	2	6	8	-0.4	4	292	46	-0.5	-5	16	0.43	0.025	0.23	0.15	1.07	0.36	7	-2	0.14	0.6	-0.1	1
RE99-74E-35-002	502155	6369397	-2	-5	2.1	180	4.9	-1	2	9	-1	0.87	6	-1	-5	-1	0.28	-20	17	0.2	2	-3	-0.01	-0.05	-0.5	3.2	1	-1	-50	12.5	21	8	1.8	0.3	-0.5	0.9	0.14	38.45	-2	2	6	20	-0.4	3	493	71	-0.5	-5	15	1.12	0.046	0.5	0.1	1.43	0.54	6	-2	0.1	-2	-5	-4
RE99-74E-37-002	507737	6350143	-2	-5	3	330	5.5	-1	3	15	1	2	5	-1	-5	-1	0.36	-20	-15	0.2	2.6	-3	-0.01	-0.05	-0.5	3.9	0.9	1	-50	13.4	26	6	1.9	0.4	-0.5	0.9	0.16	26.48	-2	2	7	22	-0.4	3	394	81	-0.5	-5	16	0.5	0.121	0.14	0.09	1.78	0.56	7	-2	0.05	0.8	-0.1	2
RE99-74E-38-002	501463	6357561	-2	-5	2.3	270	2.7	-1	3	18	-1	0.97	6	-1	-5	-1	0.39	-20	29	0.1	3	-3	-0.01	-0.05	-0.5	4.3	0.9	-1	-50	14.4	25	8	2.1	0.4	-0.5	1	0.15	35.73	-2	3	8	17	-0.4	6	174	86	-0.5	-5	23	0.53	0.044	0.22	0.11	2.09	0.71	8	-2	0.02	0.4	-0.1	2
RE99-74E-39-002	509520	6363072	-2	-5	1.6	180	3.5	-1	2	12	-1	0.69	6	-1	-5	-1	0.28	-20	-15	0.1	2.1	-3	-0.01	-0.05	-0.5	4	0.8	-1	-50	13	23	9	1.7	0.3	-0.5	0.8	0.11	39.27	-2	2	6	8	-0.4	4	395	69	-0.5	-5	12	0.56	0.046	0.25	0.11	1.35	0.48	8	-2	0.03	0.3	-0.1	-1
RE99-74E-44-002	465353	6372559	2	-5	12.9	1100	2.9	-1	8	54	3	2.18	10	-1	-5	3	0.37	124	62	1.1	7.8	-3	-0.01	-0.05	-0.5	7.9	3.4	-1	128	27.6	48	18	4.5	1	-0.5	2.7	0.38	32.23	3	15	14	80	-0.4	22	198	124	1	-5	115	0.4	0.089	0.38	0.24	3.77	1.21	21	-2	0.29	1.4	-0.1	1
RE99-74E-45-002	452075	6382222	6	-5	12.3	990	3	-1	9	65	4	2.57	11	-1	-5	3	0.34	-20	57	0.8	8.8	-3	-0.01	-0.05	1.2	8.8	3	-1	83	28.1	48	19	4.3	0.9	0.6	2.6	0.4	31.34	2	16	16	79	-0.4	24	293	115	0.9	-5	113	0.33	0.081	0.4	0.25	4.15	1.27	18	-2	0.36	0.8	-0.1	3
RE99-74E-46-002	452779	6387970	6	-5	12.9	1000	2.9	-1	13	95	7	3.08	6	-1	-5	-1	0.4	-23	107	1	13.3	-3	-0.01	-0.05	1.3	9.6	3.6	2	136	33.9	58	25	5.3	1.1	-0.5	3	0.46	24.41	2	22	20	129	-0.4	43	267	131	1.2	-5	183	0.33	0.091	0.63	0.33	6.11	1.83	23	2	0.32	1.4	0.4	13
RE99-74E-47-002	468937	6390666	2	-5	2.5	330	2.2	1	4	23	-1	1.29	7	-1	-5	-1	0.38	-20	33	0.2	3	-3	-0.01	-0.05	-0.5	6	0.9	-1	-50	19.5	32	12	2.7	0.5	-0.5	1.2	0.2	39.32	-2	3	9	28	-0.4	8	765	89	-0.5	-5	28	0.9	0.066	0.35	0.16	1.94	0.68	11	-2	0.08	-0.1	-0.1	4
RE99-74E-51-002	477493	6419311	32	-5	0.7	93	6.6	-1	-1	6	-1	0.47	5	-1	-5	-1	0.17	-20	-15	0.1	1.1	-3	-0.01	-0.05	-0.5	2.1	0.6	-1	-50	8.9	15	6	1.2	0.2	-0.5	0.6	0.1	34.66	-2	2	5	4	-0.4	2	130	54	-0.5	-5	6	0.32	0.023	0.07	0.05	0.8	0.27	4	-2	0.05	0.9	-0.1	3
RE99-74E-53-002	493813	6416060	-2	-5	1.4	72	3.1	-1	-1	8	-1	0.65	14	-1	-5	-1	0.18	-20	-15	-0.1	2.3	-3	-0.01	-0.05	-0.5	5	1.2	-1	-50	14.6	23	10	1.9	0.4	-0.5	1.2	0.19	43.86	-2	2	-5	4	-0.4	2	164	54	-0.5	-5	9	0.26	0.02	0.1	0.12	0.92	0.28	7	-2	0.01	0.6	-0.1	1
RE99-74E-55-002	487120	6321336	-2	-5	4.8	460	1.7	1	5	47	1	1.42	7	-1	-5	-1	1.02	-20	-15	0.3	4.4	-3	-0.01	-0.05	-0.5	3.9	1.6	-1	-50	15.9	26	9	2.6	0.6	-0.5	1.3	0.15	38.2	-2	3	7	34	-0.4	8	228	259	-0.5	-5	57	1.28	0.064	0.53	0.17	4.67	1.19	10	-2	0.04	1.2	-0.1	2
RE99-74E-56-002	486675	6325537	-2	-5	4.4	480	1.7	1	5	39	1	2.35	4	-1	-5	-1	1.07	-20	57	0.4	5	-3	-0.01	-0.05	-0.5	3.7	1.2	-1	-50	15.6	27	8	2.5	0.6	-0.5	1.2	0.14	35.22	-2	3	8	41	-0.4	12	286	272	-0.5	-5	61	1.48	0.072	0.63	0.17	4.69	1.29	9	-2	0.02	1.5	0.1	2
RE99-74E-57-002	491232	6332027	-2	-5	4.8	320	1.2	-1	6	39	2	1.37	12	-1	-5	-1	0.55	-20	37	0.4	5.1	-3	-0.01	-0.05	-0.5	6.2	2	-1	-50	23.1	42	13	3.7	0.8	-0.5	2.3	0.29	35.41	-2	6	10	25	-0.4	8	412	95	-0.5	-5	43	0.42	0.042	0.28	0.26	3.72	1.13	12	-2	0.02	0.9	-0.1	2
RE99-74E-58-002	493277	6342553	-2	-5	4.3	370	1.2	-1	5	27	1	1.28	11	-1	-5	-1	0.45	-20	26	0.3	4	-3	-0.01	-0.05	-0.5	6.5	1.8	-1	-50	22.1	40	11	3.4	0.6	-0.5	2	0.24	36.46	-2	5	9	22	-0.4	13	264	95	-0.5	-5	36	0.55	0.049	0.26	0.18	2.96	0.95	13	-2	0.02	0.6	-0.1	2
RE99-74E-60-002	523797	6318074	-2	-5	8.2	320	2.4	-1	4	24	-1	1.78	8	-1	-5	-1	0.36	-20	24	0.2	3.5	-3	-0.01	-0.05	-0.5	5.5	1.1	-1	-50	17.6	32	12	2.5	0.5	-0.5	1.3	0.22	25.61	-2	2	8	25	-0.4	7	424	85	-0.5	-5	27	0.46	0.076	0.19	0.17	2.31	0.65	9	-2	0.02	0.7	-0.1	2
RE99-74E-61-002	527723	6325551	-2	-5	3	200	2.4	-1	3	16	-1	0.99	8	-1	-5	-1	0.3	-20	19	0.2	2.5	-3	-0.01	-0.05	-0.5	4.2	0.9	-1	-50	13.9	25	10	2	0.4	-0.5	1	0.15	38.82	-2	2	6	11	-0.4	2	195	71	-0.5	-5	18	0.39	0.048	0.13	0.11	1.72	0.5	8	-2	0.03	0.7	-0.1	2
RE99-74E-62-002	513717	6423701	-2	-5	3.9	86	21.1	-1	2	7	-1	1.06	4	-1	-5	-1	0.14	-20	-15	-0.1	1.2	-3	-0.01	-0.05	-0.5	2.2	1	-1	-50	9.6	16	6	1.4	0.3	-0.5	0.6	0.1	21.08	-2	2	5	7	-0.4	2	323	48	-0.5	-5	10	0.42	0.065	0.09	0.04	0.74	0.23	4	-2	0.1	1.9	-0.1	1
RE99-74E-63-002	514794	6421049	-2	-5	2.4	100	4.3	-1	-1	-5	-1	0.53	3	-1	-5	-1	0.13	-20	-15	-0.1	0.9	-3	-0.01	-0.05	-0.5	1.9	-0.5	-1	-50	7.9	16	5	1.1	0.2	-0.5	0.5	0.09	29.12	-2	2	-5	4	-0.4	2	310	50	-0.5	-5	5	0.21	0.041	0.06	0.05	0.68	0.21	3	-2	0.02	0.5	-0.1	2
RE99-74E-65-002	533549	6408354	-2	-5	2.3	120	6.8	-1	-1	8	-1	0.57	5	-1	-5	-1	0.19	-20	-15	0.2	1.2	-3	-0.01	-0.05	-0.5	2.4	0.8	-1	-50	9.1	15	-5	1.3	0.3	-0.5	0.7	0.11	36.87	-2	2	8	5	-0.4	2	349	54	-0.5	-5	7	0.33	0.046	0.08	0.06	0.96	0.33	6	-2	0.03	0.2	-0.1	1
RE99-74E-66-002	543129	6409497	-2	-5	2.5	110	4.6	-1	-1	-5	-1	0.54	4	-1	-5	-1	0.14	-20	-15	0.1	1	-3	-0.01	-0.05	-0.5	2.2	0.7	-1	-50	8.9	16	6	1.2	0.3	-0.5	0.5	0.07	26.02	-2	2	-5	2	-0.4	2	80	45	-0.5	-5	3	0.17	0.044	0.05	0.03	0.57	0.2	3	-2	0.02	0.2	-0.1	1
RE99-74E-67-002	542849	6427910	-2	-5	2.4	120	16.1	-1	2	6	-1	2.14	4	-1	-5	-1	0.1	-20	-15	0.1	0.9	-3	-0.01	-0.05	-0.5	1.8	0.7	-1	-50	7.6	13	5	1.1	0.2	-0.5	0.5	0.09	34.45	-2	2	8	5	-0.4	2	1018	50	-0.5	-5	6	0.19	0.038	0.05	0.04	0.56	0.16	4	-2	0.04	0.2	-0.1	3
RE99-74E-70-002	557510	6424654	-2	-5	2	92	12	-1	-1	6	-1	0.34	4	-1	-5	-1	0.11	-20	-15	0.1	1.3	-3	-0.01	-0.05	0.6	2	0.6	-1	-50	12.7	26	10	2.4	0.5	-0.5	0.9	0.12	23.29	-2	2	8	2	-0.4	3	39	50	-0.5	-5	21	0.17	0.016	0.04	0.03	0.53	0.14	7	-2	0.04	0.4	-0.1	-1
RE99-74E-71-002	556430	6409378	-2	-5	1.5	73	3.5	-1	-1	-5	-1	0.29	3	-1	-5	-1	0.1	-20	-15	0.1	0.7	-3	-0.01	-0.05	-0.5	1.5	-0.5	-1	-50	6.6	12	-5	0.9	-0.2	-0.5	0.4	0.07	40.47	-2	2	5	2	-0.4	2	70	37	-0.5	-5	3	0.12	0.024	0.04	0.03	0.45	0.14	3	-2	0.02	0.2	-0.1	2
RE99-74E-72-002	555471	6402773	-2	-5	3	180	6.3	-1	1	-5	-1	0.63	5	-1	-5	-1	0.16	-20	-15	0.1	1.1	-3	-0.01	-0.05	-0.5	2.2	0.5	-1	-50	8.6	15	7	1.2	0.2	-0.5	0.6	0.09	34.38	-2	2	-5	2	-0.4	2	506	47	-0.5	-5	5	0.22	0.068	0.06	0.04	0.65	0.22	4	-2	0.03	0.9	-0.1	2
RE99-74E-73-002	542502	6392416	-2	-5	1.6	99	3.9	-1	1	5	-1	0.44	4	-1	-5	-1	0.13	-20	-15	0.1	1.2	-3	-0.01	-0.05	-0.5	2.5	-0.5	-1	-50	9.8	16	5	1.3	0.2	-0.5	0.6	0.09	39.71	-2	2	5	2	-0.4	2	278	41	-0.5	-5	5	0.21	0.023	0.06	0.05	0.6	0.18	4	-2	0.01	0.4	-0.1	-1
RE99-74E-74-002	548549	6383669	-2	-5	9	190	6.6	-1	-1	8	-1	1.71	7	-1	-5	-1	0.15	-20	-15	0.1	1.4	-3	-0.01	-0.05	-0.5	2.6	1.1	-1	-50	9.1	16	-5	1.3	0.3	-0.5	0.7	0.11	36.53	-2	2	-5	4	-0.4	2	157	47	-0.5	-5	6	0.5	0.167	0.09	0.05	0.7	0.22	4	-2	0.14	0.8	-0.1	2
RE99-74E-75-002	534861	6329498	-2	-5	7.6	590	3	1	7	40	3	2.22	6	-1	-5	-1	0.29	-20	78	0.4	7.4	-3	-0.01	-0.05	-0.5	7.3	2.3	-1	-50	23.9	42	18	3.8	0.8	-0.5	2	0.26	24.94	-2	9	13	37	-0.4	9	326	131	-0.5	-5	69	0.58	0.062	0.52	0.22	4.88	1.15	12	-2	0.1	2.6	-0.1	2
RE99-74E-76-002	543099	6325027	2	-5	3.4	280	3.3	-1	4	26	1	1.21	9	-1	-5	-1	0.29	-20	22	0.2	4.2	-3	-0.01	-0.05	-0.5	6.7	1.9	-1	-50	20.4	35	13	3	0.5	-0.5	1.5	0.25	30.97	-2	4	7	25	-0.4	5	268	70	-0.5	-5	40	0.45	0.048	0.22	0.15	2.35	0.62	10	-2	0.04	0.3	-0.1	1
RE99-74E-77-002	556750	6318900	-2	-5	1.7	140	2.4	-1	-1	5	-1	0.4	4	-1	-5	-1	0.19	-20	-15	-0.1	1.1	-3	-0.01	-0.05	-0.5	2.4	0.6	-1	-50	9.2	17	5	1.2	0.3	-0.5	0.5	0.09	44.05	-2	2	-5	2	-0.4	2	57	52	-0.5	-5	5	0.24	0.014	0.06	0.05	0.84	0.28	3	-2	0.09	0.2	-0.1	1
RE99-74E-79-002	553527	6333766	-2	-5	6	390	27.1	2	3	13	-1	3.43	4	-1	-5	-1	0.22	-20	-15	0.1	2.1	-3	-0.01	-0.05	-0.5	2.5	0.8	-1	-50	9.9	19	7	1.5	0.3	-0.5	0.8	0.13	13.72	-2	3	6	20	-0.4	2	1637	58	-0.5	-5	15	1.69	0.307	0.21	0.05	1.18	0.31	6	-2	0.43	1.5	-0.1	2
RE99-74E-80-002	550884	6344920	-2	-5	1	170	2.5	-1	-1	5	-1	0.41	6	-1	-5	-1	0.2	-20	-15	0.2	1.4	-3	-0.01	-0.05	0.5	3.1	0.6	-1	-50	11.2	19	6	1.5	0.3	-0.5	0.7	0.12	45.42	-2	2	6	2	-0.4	3	98	58	-0.5	-5	7	0.25	0.033	0.06	0.08	1	0.4	4	-2	0.01	0.2	-0.1	-1
RE99-74E-82-002	559889	6366853	-2	-5	0.8	88	2.4	-1	-1	6	-1	0.38	6	-1	-5	-1	0.17	-20	-15	0.1	1.5	-3	-0.01	-0.05	-0.5	6.5	1	-1	-50	19.4	30	11	2	0.3	-0.5	0.8	0.12	42.17	-2	2	7	2	-0.4	2	98	46	-0.5	-5	7	0.18	0.02	0.07	0.08	0.89	0.33	6	-2	0.01	0.3	-0.1	-1
RE99-74E-84-002	519915	6361954	-2	-5	1.4	210	9.8	-1	2	13	-1	1.23	6	-1	-5	-1	0.28	-20	20	0.1	2.3	-3	-0.01	-0.05	-0.5	4.1	0.9	-1	-50	13.5	25	9	2	0.4	-0.5	0.9	0.12	27.09	-2	2	7	13	-0.4	3	252	65	-0.5	-5	13	0.72	0.088	0.27	0.1	1.44	0.45	7	-2	0.07	2.1	-0.1	2
RE99-74E-85-015	498037	6368858	-2	-5	5.6	270	1.2	2	5	36	2	1.57	21	-1	-5	-1	0.31	-20	23	0.3	4.7	-3	-0.01	-0.05	-0.5	7.7	2.2	-1	-50	25	50	21	4	0.9	-0.5	2.9	0.42	30.44	-2	4	8	17	-0.4	8	207	74	-0.5	-5	29	1.02	0.029	0.49	0.18	2.06	0.7	11	-2	0.28			
RE99-74E-86-002	491647	6356389	-2	-5	1.3	170	4.1	-1	2	10	-1	0.82	6	-1	-5	-1	0.14	-20	-15	0.1	1.5	-3	-0.01	-0.05	-0.5	3.4	0.7	-1	-50	11.1	19	7	1.5	0.3	-0.5	0.8	0.1	37.19	-2	2	5	7	-0.4	2	652	44	-0.5	-5	11	0.5	0.036	0.15	0.09	1.01	0.32	4	-2	0.05	0.5	-0.1	-1
RE99-74E-87-002	521768	6355819	-2	-5	1.2	160	2.2	-1	1	16	-1	0.76	12	-1	-5	-1	0.26	-20	-15	0.1	3	-3	-0.01	-0.05	-0.5	5.6	1.1	-1	-50	16.9	28	10	2.2	0.4	-0.5	1.3	0.21	41.18	-2	2	6	7	-0.4	2	219	59	-0.5	-5	13	0.47	0.028	0.14	0.17	1.28	0.33	9	-2	0.02	-0.1	-0.1	-1
RE99-74E-88-002	517625	6366955	-2	-5	1	88	2.6	-1	-1	5	-1	0.4	3	-1	-5	-1	0.17	-20	-15	0.1	1	-3	-0.01	-0.05	-0.5	2.4	-0.5	-1	-50	9	16	6	1.2	0.2	-0.5	0.5	0.09	36.93	-2	2	5	5	-0.4	2	177	47	-0.5	-5	5	0.28	0.019	0.07	0.04	0.84	0.28	3	-2	0.02	-0.1	-0.1	1
RE99-74E-89-002	502668	6384908	-2	-5	1.6	170	1.4	-1	2	22	-1	0.57	15	-1	-5	-1	0.19	-20	-15	0.2	2.4	-3	-0.01	-0.05	0.5	5.9	1.1	-1	-50	19.5	35	13	2.6	0.4	-0.5	1.5	0.2	43.91	-2	2	6	6	-0.4	2	126	53	-0.5	-5	13	0.26	0.023	0.09	0.2	1.07	0.37	8	-2	0.04	1.4	0.2	1
RE99-74E-90-002	517602	6385265	-2	-5	2.1	120	3.1	-1	1	11	-1	0.61	6	-1	-5	-1	0.15	-20	-15	0.1	1.6	-3	-0.01	-0.05	-0.5	3.8	0.7	-1	-50	12.9	22	8	1.8	0.3	-0.5	0.9	0.14	22.5	-2	2	5	5	-0.4	2	294	44	-0.5	-5	9	0.3	0.018	0.1	0.07	0.93	0.32	4	-2	0.04	0.4	-0.1	1
RE99-74E-91-002	525595	6379788	-2	-5	1.5	110	2.7	-1	2	7	-1	0.55	4	-1	-5	1	0.18	-20	-15	0.1	1.5	-3	-0.01	-0.05	-0.5	2.8	0.8	-1	-50	12.8	26	10	1.5	0.3	-0.5	0.9	0.14	4.113	-2	2	5	3	-0.4	2	171	40	-0.5	-5	3	0.22	0.018	0.07	0.04	0.59	0.18	4	-2	0.01	0.5	-0.1	1
RE99-74E-92-002	532118	6378004	-2	-5	0.7	96	2.3	-1	-1	-5	-1	0.25	2	-1	-5	-1	0.14	-20	-15	-0.1	0.9	-3	-0.01	-0.05	-0.5	1.8	-0.5	-1	-50	8.6	15	6	1.2	0.2	-0.5	0.4	0.07	22.09	-2	2	-5	2	-0.4	2	42	39	-0.5	-5	4	0.12	0.009	0.04	0.02	0.51	0.18	2	-2	0.01	-0.1	-0.1	2
RE99-74E-93-002	556860	6383129	-2	-5	1.3	200	4	-1	-1	13	-1	0.43	5	-1	-5	2	0.17	-20	-15	0.1	1.4	-3	-0.01	-0.05	-0.5	4.1	0.8	-1	-50	12.4	21	7	1.7	0.3	-0.5	0.7	0.09	12.53	-2	2	-5	2	-0.4	2	314	41	-0.5	-5	6	0.15	0.023	0.05	0.05	0.55	0.21	3	-2	0.02	0.2	-0.1	1
RE99-74E-94-002	540945	6370215	-2	-5	1.8	70	2.5	-1	-1	-5	-1	0.34	2	-1	-5	-1	0.13	-20	-15	-0.1	0.8	-3	-0.01	-0.05	-0.5	1.5	-0.5	-1	-50	7.2	12	-5	0.9	-0.2	-0.5	0.4	0.06	38.79	-2	2	5	2	-0.4	2	83	43	-0.5	-5	3	0.2	0.05	0.05	0.04	0.6	0.19	3	-2	0.02	0.2	-0.1	-1
RE99-74E-96-027	459519	6338652	-2	-5	6.5	370	1.5	2	6	32	1	1.5	6	-1	-5	-1	0.4	-20	25	0.3	4.2	-3	-0.01	-0.05	-0.5	4.5	1.5	-1	-50	17.1	34	15	2.9	0.7	-0.5	1.3	0.18	28.81	-2	3	7	30	-0.4	5	223	87	-0.5	-5	45	0.75	0.038	0.39	0.15	2.31	0.88	9	-2	0.1			
RE99-73E-98-002			-2	-5	7.1	260	17.6	10	6	31	2	3.96	4	-1	-5	-1	0.2	-24	31	0.3	4.5	-3	-0.01	-0.05	-0.5	5	1.3	-1	-50	16.4	32	15	2.5	0.6	-0.5	1.3	0.19	24.78	-2	5	-5	39	-0.4	4	882	174	-0.5	-5	40	8.92	0.081	0.68	0.12	2.33	0.77	8	-2	0.24			
																																							-2	4	-5	41	-0.4	11	863	171	-0.5	-5	36	8.71	0.092	0.66	0.11	2.33	0.75	9	-2	0.29			

Appendix 4a. 1999 Stream Sediment HMC Sample Geochemistry

Appendix 4a. 1999 stream sediment HMC sample descriptions.

Sample Number and Date	Stream Name	GPS Location	Field Rating	Trap Location	Trap Descr.	Horiz. Relation	Vert. Relation	Material % and Type	Packing	Texture	Lithology and %	Largest Clast	Water Velocity	Outcrop
RE99-74E-03-002 18-Jun-99	N/A	464118 6334930	N/A	N/A	N/A	N/A	N/A	*3 Kg dry sieved fine fraction. Sample of Bedrock--Altered material at top of Devonian. Part Regolith!!*						
RE99-74E-06-001 18-Jun-99	Jackpine Cr /Hartley Cr.	475047 6343820	Moderate	Main Channel	Boulder Obstruction	Down stream	Drop <30 cm	Cobble 20-50 Pebble 20-5 Granule 20-5 Sand/Silt 20-5	Firm	Clast Support	SS 10 Gn 30 Gr 60	0.5 m	Med.	None
RE99-74E-07-001 19-Jun-99	N. Muskeg Creek	481050 6348900	Mod. Due to proximity of bridge only.	Channel Edge Inside	Boulder Obstruction	Down stream	Drop <30 cm	Cobble <5 Pebble <5 Granule 50-20 Sand/Silt 50-20	Slightly Loose	Matrix Support	SS 5 Gn 5 Gr 80 Qtz 10	1 m Granite	Slow	None
RE99-74E-08-001 19-Jun-99	No Name	490290 6355752	Moderate Good	Main Channel	Boulder Obstruction	Down stream	Drop >30 cm	Cobble <5 Pebble 20-5 Granule 50-20 Sand/Silt 50-20	Slightly Loose	Matrix Support	Gn 10 Gr 90	35 cm Granite	Slow	None
RE99-74E-09-001 19-Jun-99	No Name	495475 6346826	Poor Moderate	Main Channel	Tree Obstruction	Down stream	No Drop	Sand/Silt >50	Loose	Matrix Support	N/A	N/A	Slow	None
RE99-74E-10-001 21-Jun-99	MacKay River	449075 6319655	Good	Main Channel	Boulder Obstruction	Down stream	Drop >30 cm	Cobble 50-20 Pebble 50-20 Granule 50-20 Sand/Silt 20-5	Firm	Clast Support	SS 20 Gr 80	1.5 m Granite	Med.	None
RE99-74E-11-001 21-Jun-99	MacKay River	453327 6328024	Good	Main Channel	Base of Rapids	Down stream	Drop >30 cm	Cobble 50-20 Pebble 50-20 Granule 50-20 Sand/Silt 20-5	Firm	Inter.	SS 20 Gn 10 Gr 70	0.7 m	Fast	Oilsands
RE99-74E-12-001 21-Jun-99	No Name Creek	453142 6329923	Poor Moderate	Main Channel	Shallow Point	Down stream	Drop <30 cm	Cobble 50-20 Pebble 50-20 Granule 20-5 Sand/Silt 20-5	Firm	Clast Support	SS 40 Gn 10 Gr 50	0.8 m SS	Slow	None
RE99-74E-13-001 21-Jun-99	MacKay River	458730 6340669	Poor	Main Channel	Shallow Point	Down Stream	No Drop	Sand/Silt >50	Loose	Matrix Support	SS 60 Gr 40	0.6 m SS	Slow	Sub-Cretaceous Unconform.
			*Possibe fault upstream, affects sub-cretaceous unconformity and devonian.											
RE99-74E-14-001 21-Jun-99	Dover River	453311 6336186	Poor Moderate	Channel Edge Inside	Shallow Point	Down stream	Drop <30 cm	Cobble <5 Pebble 50-20 Granule 50-20 Sand/Silt <5	Firm	Inter.	SS 60 Gn 10 Gr 30	0.25 m SS	Medium	Oilsands
RE99-74E-15-001 21-Jun-99	Dover River	446280 6334742	Good	Main Channel	Boulder Obstruction	Down stream	Drop >30 cm	Cobble 50-20 Pebble 20-5 Granule 20-5 Sand/Silt 20-5	Firm	Clast Support	SS 60 Gn 10 Gr 30	2 m	Medium	None
			Sample done twice. Poor Panning job here											
RE99-74E-16-001 21-Jun-99	Ells River	441457 6342900	Good	Main Channel	Boulder Obstruction	Down stream	Drop >30 cm	Cobble 20-5 Pebble 20-5 Granule 50-20 Sand/Silt >50	Loose	Matrix Support	SS 90 Gn 5 Gr 5	2 m SS	Medium	None
RE99-74E-17-001 21-Jun-99	Ells River	453283 6343452	Moderate Good	Main Channel	Boulder Obstruction	Down stream	Drop <30	Cobble 20-5 Pebble 50-20 Granule 50-20 Sand/Silt <5	Firm	Clast Support	SS 30 Gn 10 Gr 60	0.9 m Granite	Medium	Oilsands
RE99-74E-19-001 21-Jun-99	Jocelyn Creek	457259 6349748	Moderate	Main Channel	Base of Rapids	Down stream	No Drop	Cobble 50-20 Pebble >50 Granule 20-5 Sand/Silt 20-5	Firm	Inter.	SS 40 Gn 10 Gr 40 Qtz 10	1 m SS	Medium	SS
RE99-74E-20-001 21-Jun-99	Tar River	456608 6355565	Poor	Main Channel	Shallow Point	Down stream	Drop >30 cm	Cobble 20-5 Pebble 50-20	Slightly Loose	Clast Support	SS 70 Gr 30	0.6 m Granite	Medium	None
			Downstream from large beaver dam											
RE99-74E-21-001 21-Jun-99	Tar River	443825 6359678	Poor Moderate	Main Channel	Tree Obstruction	Down stream	No Drop	Cobble <5 Pebble 50-20 Granule 50-20 Sand/Silt 50-20	Slightly Loose	Inter.	SS 20 Gn 10 Gr 70	0.3 m Granite	Medium	None
RE99-74E-22-001 21-Jun-99	Jocelyn Creek	440397 6351616	Poor Moderate	Main Channel	Shallow Point	Down stream	Drop <30 cm	Cobble 20-5 Pebble 20-5 Granule 20-5 Sand/Silt 20-5	Firm	Inter.	SS 45 Gn 10 Gr 45	0.8 m Granite	Medium	None
RE99-74E-23-001 22-Jun-99	Pierre River	442929 6372897	Moderate Good	Main Channel	Base of Rapids	Down stream	Drop <30 cm	Cobble 50-20 Pebble 20-5 Granule 20-5 Sand/Silt 20-5	Slightly Loose	Inter.	SS 10 Gr 90	1 m Granite	Fast	Shaftesbury
			Possible slumping at creek											
RE99-74E-24-001 22-Jun-99	Pierre River	460722 6369063	Moderate	Main Channel	Base of Rapids	Down stream	No Drop	Cobble 20-5 Pebble 20-5 Granule 20-5 Sand/Silt 20-5	Firm	Inter.	SS 5 Gn 15 Gr 80	0.6 m Granite	Medium	None
RE99-74E-025-001 22-Jun-99	Fort Creek	462745 6363296	Moderate	Main Channel	Base of Rapids	Down stream	No Drop	Cobble 20-5 Pebble 50-20 Granule 50-20 Sand/Silt 20-5	Firm	Matrix Support	SS 45 Gr 55	0.3 m Granite	Medium	Oilsands
RR99-74E-26-001 22-Jun-99	McClelland Lake	480910 6369367	N/A Lake shore	N/A	N/A	N/A	N/A	Cobble 20-5 Pebble 20-5 Granule 50-20 Sand/Silt 50-20	Loose	Matrix Support	Granitic	0.2 m	N/A	N/A
RE99-74E-27-001 22-Jun-99	Firebag-Athabasca confluence	479029 6401348	Poor Moderate	Channel Edge Outside	Shoreline	None	No Drop	Cobble <5 Pebble 50-20 Granule 50-20 Sand/Silt >50	Loose	Matrix Support	SS 10 Gn 20 Gr 50 Qtz 20	0.3 m Granite and SS clasts	Medium	Athabasca SS
RE99-74E-28-001 22-Jun-99	Firebag River	489825 6387448	Moderate Good	Main Channel/ Channel Bar	N/A	Down stream	No Drop	Cobble <5 Pebble 20-5 Granule 50-20 Sand/Silt >50	Loose	Matrix Support	SS 15 Gn 10 Gr 75	0.15 m Granite	Medium	N/A
RE99-74E-29-001 22-Jun-99	Firebag River	494146 6383198	Good	Channel Edge Outside	Boulder Obstruction	Down stream	Drop <30 cm	Cobble >50 Pebble 50-20 Granule 20-5	Firm	Clast Support	SS 5 Gn 15 Gr 80	1 m Granite	Fast	N/A

Appendix 4a. 1999 stream sediment HMC sample descriptions.

Sample Number and Date	Stream Name	GPS Location	Field Rating	Trap Location	Trap Descr.	Horiz. Relation	Vert. Relation	Material % and Type	Packing	Texture	Lithology and %	Largest Clast	Water Velocity	Outcrop
								Sand/Silt 20-5						
RE99-74E-30-001 22-Jun-99	Marguerite River	494210 6383198	Moderate	Channel Edge Inside	Shallow Point	Between	No Drop	Cobble >50 Pebble 50-20 Granule 20-5 Sand/Silt 20-5	Very Firm	Clast Support	Granitic	1 m Granite	Medium	N/A
RE99-74E-031-001 22-Jun-99	Firebag River	495267 6377545	Good	Channel Bar	Boulder Obstruction	Down stream	Drop >30 cm	Cobble 50-20 Pebble 50-20 Granule 50-20 Sand/Silt 20-5	Firm	Inter.	Granitic	1.5 m Granite	Fast	N/A
RE99-74E-32-001 24-Jun-99	Firebag River	493974 6375081	Moderate Good	Channel Bar	Shallow Point	Down stream	No Drop	Cobble <5 Pebble 20-5 Granule 20-5 Sand/Silt 50-20		Matrix Support	SS 10 Gn 10 Gr 80	0.08 m Granite	Fast	Glacial/ Fluvial?
RE99-74E-33-001 24-Jun-99	Firebag River	496371 6369931	Moderate	Channel Bar		Down stream	No Drop	Cobble <5 Pebble 20-5 Granule 50-20 Sand/Silt >50			SS 10 Gr 90	0.1 m Granite	Fast	Oilsands
RE99-74E-34-001 24-Jun-99	No Name flows into Firebag	502683 6369524	Moderate Good	Channel Edge Outside	Shallow Point/Bank Edge	Between	No Drop	Cobble 50-20 Pebble 50-20 Granule 20-5 Sand/Silt 20-5	Firm	Inter.	Granitic	0.3 m Granite	Flood	N/A
RE99-74E-35-001 24-Jun-99	Firebag River (Mike's Bar)	502155 6369397	Good *Sulphide Rich*	Channel Bar	N/A	Down stream	No Drop	Cobble <5 Pebble 20-5 Granule 50-20 Sand/Silt 20-5	Firm	Inter.	SS 20 Gn 20 Gr 40 Qtz 10 Fe Oxide 10	0.3 m Granite	Fast	N/A
RE99-74E-36-001 24-Jun-99	N/A	501761 6364460	N/A	N/A *Glacial/Fluvial Sample from the Knob*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
RE99-74E-37-001 24-Jun-99	No Name	507737 6350143	Poor Moderate	Main Channel	Shallow Point	Between	No Drop	Sand/Silt >50	Loose	Matrix Support	N/A	N/A	Slow	Swamp
RE99-74E-38-001 24-Jun-99	No Name	510463 6357561	Moderate Good	Channel Edge Outside	Base of Rapids	Down stream	Drop <30 cm	Cobble 20-5 Pebble 20-5 Granule 20-5 Sand/Silt 50-20	Firm	Matrix Support	SS 10 Gr 90	0.25 m Granite	Fast	N/A
RE99-74E-39-001 24-Jun-99	Firebag River	509520 6363072	Moderate Good	Channel Bar	Shallow Point	Between	Drop <30 cm	Cobble 50-20 Pebble 20-5 Granule 20-5 Sand/Silt 20-5	Firm		SS 50 Gr 50	0.45 m Granite	Medium	N/A
RE99-74E-40-001 24-Jun-99	Marguerite River	499618 6386317	Moderate	Channel Bar	Shallow Point	Down stream	No Drop	Sand/Silt >50	Loose	Matrix Support	N/A	N/A	Slow	Glacial/ Fluvial?
RE99-74E-41-001 24-Jun-99	Marguerite River	505157 6397018	Poor Moderate	Channel Bar	Shallow Point	Down stream		Sand/Silt >50	Loose	Matrix Support	N/A	N/A	Slow	Glacial/ Fluvial?
RE99-74E-42-001 24-Jun-99	Marguerite River	512206 6394024	Poor	Channel Edge Outside	Shallow Point	Between	No Drop	Sand/Silt >50	Loose	Matrix Support	N/A	N/A	Slow	N/A
RE99-74E-43-001 24-Jun-99	Reid Creek	515181 6391613	Poor	Channel Edge Outside	Shallow Point	Between	No Drop	Sand/Silt >50	Loose	Matrix Support	N/A	N/A	Slow	N/A
RE99-74E-44-001 25-Jun-99	Asphalt Creek	465353 6372559	Moderate	Main Channel	Shallow Point	Between	No Drop	Cobble <5 Pebble 20-5 Granule 20-5 Sand/Silt >50	Loose	Matrix Support	Granitic	0.08 m	Medium	Oilsands
RE99-74E-45-001 25-Jun-99	Asphalt Creek	452075 6382222	Moderate Good	Main Channel	Base of Rapids	Down stream	Drop <30 cm	Cobble 50-20 Pebble 20-5 Granule 20-5 Sand/Silt 20-5	Very Firm	Clast Support	Gn 20 Gr 80	0.8 m Granite	Medium	Shaftesbury
RE99-74E-46-001 25-Jun-99	Big Creek	452779 6387970	Moderate	Main Channel	Base of Rapids	Down stream	Drop <30 cm	Cobble >50 Pebble 50-20 Granule 20-5 Sand/Silt 20-5	Very Firm	Clast Support	Gn 30 Gr 40 Qtz 30	0.3 m Qtzite	Fast	N/A
RE99-74E-47-001 25-Jun-99	Big Creek	468937 6390666	Moderate Good	Main Channel	Shallow Point Conflu. of 2 Creeks	Down stream	No Drop	Cobble 20-5 Pebble 20-5 Granule 20-5 Sand/Silt >50	Loose	Matrix Support	Gn 10 Gr 60 Qtz 30	0.4 m Granite	Medium	N/A
RE99-74E-48-001 25-Jun-99	Buckton Creek	445973 6413507	Moderate Good	Main Channel	Boulder Obstruction	Down stream	Drop <30 cm	Cobble >50 Pebble 20-5 Granule 20-5 Sand/Silt 20-5	Firm	Inter.	Gn 20 Gr 60 Qtz 20	1 m Gneiss	Fast	N/A
RE99-74E-49-001 25-Jun-99	Buckton Creek	453297 6428457	Moderate Good	Main Channel	Beaver Dam	Down stream	Drop >30 cm	Sand/Silt >50	Loose	Matrix Support	N/A	N/A	Medium	N/A
RE99-74E-50-001 25-Jun-99	Ronald Lake Esker	462379 6422870	Poor Moderate	N/A *20 kg of sand panned by Hydro to an HMC*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
RE99-74E-51-001 25-Jun-99	Grayling Creek	477993 6419311	Moderate Good	Channel Edge Inside	Shallow Point	Between	No Drop	Granule 20-5 Sand/Silt >50	Loose	N/A	N/A	N/A	N/A	Sand Dunes
RE99-74E-52-001 25-Jun-99	Pearson Lake	486966 6422104	N/A *Took a 15 Kg sample of sand from a circular topo high South of Pearson Lake*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
RE99-74E-53-001 25-Jun-99	Grayling Creek	493813 6416060	Moderate	Main Channel	Shallow Point	Between	No Drop	Sand/Silt >50	Loose	Matrix Support	N/A	N/A	Slow	Sand Dunes
RE99-74E-54-001 26-Jun-99	Steepbank River	473459 6319179	Moderate	Channel Edge Inside	Shallow Point	Between	No Drop	Tarsands >50 Granule 20-5 Sand/Silt 20-5	Firm	Matrix Support	SS 80 Gr 15 Qtz 5	0.5 m Granite	Medium	Oilsands
RE99-74E-55-001 26-Jun-99	Hartley?/ Jackpine? Creek	487120 6321336	Moderate Good	Main Channel	Boulder Obstruction	Down stream	Drop <30 cm	Sand/Silt >50	Firm	Matrix Support	SS 50 Gr 50	0.65 m SS	Medium	N/A
RE99-74E-56-001 26-Jun-99	No Name	486675 6325537	Good	Main Channel	Base of Rapids	Down stream	Drop <30 cm	Cobble 20-5 Pebble 20-5 Granule 50-20 Sand/Silt 50-20	Firm	Inter.	Granitic	1 m Granite	Medium	N/A
RE99-74E-57-001 26-Jun-99	No Name	491232 6332027	Moderate	Main Channel	Shallow Point	Between	No Drop	Pebble 20-5 Granule 20-5	Loose	Matrix Support	N/A	N/A	Medium	N/A

Appendix 4a. 1999 stream sediment HMC sample descriptions.

Sample Number and Date	Stream Name	GPS Location	Field Rating	Trap Location	Trap Descr.	Horiz. Relation	Vert. Relation	Material % and Type	Packing	Texture	Lithology and %	Largest Clast	Water Velocity	Outcrop
								Sand/Silt >50						
RE99-74E-58-001 26-Jun-99	No Name	493277 6342553	Moderate Good	Main Channel	Tree Obstruction	Down stream	No Drop	Sand/Silt >50	Slightly Loose	Matrix Support	N/A	N/A	Medium	Sand Dunes
RE99-74E-59-001 26-Jun-99	North Steepbank	503014 6345201	Poor	Main Channel	Mainly Organics	N/A *Very Poor Site. Only 100 g taken*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
RE99-74E-60-001 26-Jun-99	No Name	523797 6318074	Moderate	Main Channel	Tree Obstruction	Down stream	No Drop	Sand/Silt >50	Slightly Loose	Matrix Support	N/A	N/A	Slow	N/A
RE99-74E-61-001 26-Jun-99	No Name	527723 6325551	Poor Moderate	Main Channel	Shallow Point	Between	No Drop	Pebble <5 Granule 20-5 Sand/Silt >50	Loose	Matrix Support	N/A	N/A	Slow	N/A
RE99-74E-62-001 9-Jul-99	Richardson River	513717 6423701	Moderate Good	Channel Bar	Gravel/ Boulder upstream gravel bar	Upstream	No Drop	Cobble >50 Pebble 50-20 Granule 50-20 Sand/Silt 20-5	Firm	Clast Support	SS 60 Gn 10 Gr 30	0.3 m Gneiss	Medium	Sand
RE99-74E-63-001 9-Jul-99	Richardson River	514794 6421049	Moderate	Main Channel	Base of Rapids	Down stream	No Drop	Cobble 50-20 Pebble 50-20 Granule 50-20 Sand/Silt 50-20	Slightly Loose	Inter.	SS 35 Gn 25 Gr 40	0.25 m Granite	Medium	Glacial/ Fluvial
RE99-74E-64-001 9-Jul-99	Richardson River	528906 6416238	Moderate Good	Channel Bar	Boulder Obstruction	Down stream	Drop <30 cm	Cobble >50 Pebble 50-20 Granule 20-5 Sand/Silt 20-5	Firm	Clast Support	SS 20 Gn 20 Gr 50 Qtz 10	0.75 m Granite	Fast	N/A
RE99-74E-65-001 9-Jul-99	Marguerite River	533549 6408354	Moderate Good	Channel Bar		Down stream	Drop <30 cm	Cobble 20-5 Pebble 50-20 Granule 50-20 Sand/Silt 50-20	Slightly Loose	Inter.	SS 25 Gn 25 Gr 25 Qtz 25	0.65 m Granite	Fast	Granite
RE99-74E-66-001 9-Jul-99	Richardson River	543129 6409497	Poor Moderate	Channel Bar	Shallow Point	Between	No Drop	Sand/Silt >50	Loose	Matrix Support	N/A	N/A	Medium	N/A
RE99-74E-67-001 9-Jul-99	Maybelle River	542849 6427910	Moderate	Channel Edge Outside		Between	No Drop	Cobble <5 Pebble <5 Granule <5 Sand/Silt >50	Loose	Matrix Support	Qtz 100	0.15 m Qtzite	Slow	N/A
RE99-74E-68-001 9-Jul-99	Roberts Creek	542900 6427800	Poor Moderate	Main Channel	Base of Rapids	Down stream	Drop <30 cm	Cobble >50 Pebble 20-5 Granule <5 Sand/Silt <5	Very Firm	Clast Support	SS 20 Gn 15 Gr 15 Qtz 50	1 m Granite	Medium	N/A
RE99-74E-69-001 9-Jul-99	Maybelle River	552100 6427853	Moderate	Channel Bar	Shallow Point	Down stream	No Drop	Cobble 20-5 Pebble 50-20 Granule 50-20 Sand/Silt 50-20	Slightly Loose	Matrix Support	Gn 30 Gr 50 Qtz 20	0.25 m Granite	Medium	N/A
RE99-74E-70-001 9-Jul-99	Maybelle River	557510 6424654	Moderate Good	Main Channel	Deep point or pool and base of rapids	Down stream	Drop <30 cm	Cobble 20-5 Pebble 50-20 Granule 50-20 Sand/Silt 50-20	Firm	Inter.	SS 10 Gn 20 Gr 50 Qtz 20	0.3 m Granite	Fast Medium	Granite
RE99-74E-71-001 9-Jul-99	No Name	556430 6409378	Very Poor	Main Channel	Shallow Point	Down stream	No Drop	Granule 20-5 Sand/Silt >50	Loose	Matrix Support	N/A	N/A	Slow	N/A
RE99-74E-72-001 9-Jul-99	Richardson River	555471 6402773	Moderate Good	Channel Edge Outside	Base of Rapids	Down stream	Drop <30 cm	Cobble 50-20 Pebble 50-20 Granule 50-20 Sand/Silt 50-20	Firm	Inter.	Gn 10 Gr 60 Qtz 30	0.45 m Granite	Medium	N/A
RE99-74E-73-001 9-Jul-99	Johnson River	542502 6392416	Moderate	Main Channel	Shallow Point	Between	No Drop	Pebble <5 Granule <5 Sand/Silt >50	Loose	Matrix Support	N/A	N/A	Medium	N/A
RE99-74E-74-001 9-Jul-99	No Name	548549 6383669	Moderate	Main Channel	Boulder Obstruction	Down stream	Drop < 30 cm	Cobble 50-20 Pebble 20-5 Granule 20-5 Sand/Silt 20-5	Very Firm		Gr 80 Qtz 20	0.5 m Granite	Slow	N/A
RE99-74E-75-001 10-Jul-99	No Name	534861 6329498	Poor Moderate	Main Channel	Shallow Point	Between	No Drop	Sand/Silt >50	Loose	Matrix Support	N/A	N/A	Slow	N/A
RE99-74E-76-001 10-Jul-99	No Name	543099 6325027	Poor	Channel Edge Outside	Shallow Point	Between	No Drop	Sand/Silt >50	Loose	Matrix Support	N/A	N/A	Slow	N/A
RE99-74E-77-001 10-Jul-99	High Hill River	556750 6318900	Poor Moderate	Main Channel	Shallow Point	Between	No Drop	Sand/Silt >50	Loose	Matrix Support	N/A	N/A	Slow	N/A
RE99-74E-78-001 10-Jul-99	No Name	552370 6330600	Moderate	Main Channel	Small Stream Draining~5 Drainages	Between	No Drop	Cobble <5 Pebble 50-20 Granule >50 Sand/Silt 20-5	Slightly Loose	Matrix Support	Granitic	0.05 m Granite	Medium	N/A
RE99-74E-79-001 10-Jul-99	No Name	553527 6333766	Poor	Channel Edge Outside	Shallow Point	Between	No Drop	Sand/Silt >50	Loose	Matrix Support	N/A	N/A	Slow	N/A
RE99-74E-80-001 10-Jul-99	Firebag River	550884 6344920	Poor Moderate	Channel Edge Inside	Shallow Point	Between	No Drop	Sand/Silt >50	Loose	Matrix Support	N/A	N/A	Medium	Sand
RE99-74E-81-001 10-Jul-99	Firebag River	558526 6358626	Moderate	Channel Bar	Shallow Point	Down stream	No Drop	Sand/Silt >50	Loose	Matrix Support	N/A	N/A	Slow	N/A
RE99-74E-82-001 10-Jul-99	Trout Creek	559889 6366853	Moderate	Main Channel	8 m Beaver Dam	Down stream	No Drop	Sand/Silt >50	Loose	Matrix Support	N/A	N/A	Medium	N/A
RE99-74E-83-001 10-Jul-99	Firebag River	534004 6352839	Moderate Good	Channel Bar	Shallow Point	Down stream	No Drop	Cobble 20-5 Pebble 50-20 Granule 20-5 Sand/Silt 20-5	Firm	Inter.	Gn 40 Gr 40 Qtz 20	0.3 m Gneiss	Medium	N/A
RE99-74E-84-001 10-Jul-99	Firebag River	519915 6361954	Moderate	Channel Bar	Boulder Obstruction	Down stream	No Drop	Cobble 20-5 Pebble 50-20 Granule 50-20 Sand/Silt 20-5	Firm	Inter.	Gn 20 Gr 70 Qtz 10	1 m Granite	Medium	N/A
RE99-74E-85-001 10-Jul-99	No Name	498037 6368858	Moderate Good	Main Channel	Base of Rapids	Down stream	No Drop	Cobble 50-20 Pebble 20-5 Granule 20-5 Sand/Silt 20-5	Firm	Clast Support	Gn 20 Gr 50 Qtz 29 Fe Oxide 1%	0.65 m	Medium	N/A
RE99-74E-86-001 11-Jul-99	Muskeg River	491647 6356389	Moderate Good	Main Channel	Boulder Obstruction	Down stream	Drop > 30 cm	Cobble 50-20 Pebble 50-20 Granule 50-20	Firm	Inter.	Gn 25 Gr 60 Qtz 15	0.25 m Granite	Medium	N/A

Appendix 4a. 1999 stream sediment HMC sample descriptions.

Sample Number and Date	**Stream Name**	**GPS Location**	**Field Rating**	**Trap Location**	**Trap Descr.**	**Horiz. Relation**	**Vert. Relation**	**Material % and Type**	**Packing**	**Texture**	**Lithology and %**	**Largest Clast**	**Water Velocity**	**Outcrop**
								Sand/Silt 50-20						
RE99-74E-87-001	No Name	521768 6355819	Moderate Good	Main Channel	Boulder Obstruction	Down stream	Drop < 30 cm	Cobble 50-20 Pebble 50-20 Granule 20-5 Sand/Silt 20-5	Loose	Matrix Support	Granitic Quartz	0.5 m Granite	Slow	N/A
RE99-74E-88-001	No Name	517625 6366955	Good	Main Channel	Boulder Obstruction	Down stream	Drop <30 cm	Cobble 20-5 Pebble 20-5 Granule <5 Sand/Silt >50	Slightly Loose	Matrix Support	Granitic	1 m Granite	Slow	N/A
RE99-74E-89-001	No Name	502688 6384908	Moderate Good	Main Channel	Base of Beaver Dam	Down stream	Drop >30 cm	Sand/Silt >50	Loose	Matrix Support	N/A	N/A	Medium	N/A
RE99-74E-90-001	No Name ?	517602 6385265	Good	Main Channel	Base of Rapids	Down stream	Drop <30 cm	Cobble 50-20 Pebble 50-20 Granule 50-20 Sand/Silt 20-5	Very Firm	Clast Support	Gn 10 Gr 50 Qtz 40	1.5 m Granite	Fast	N/A
RE99-74E-91-001	No Name	525595 6379788	Moderate Good	Main Channel	Base of Rapids	Down stream	Drop <30 cm	Cobble 50-20 Pebble 20-5 Granule 20-5 Sand/Silt 20-5	Firm	Clast Support	Gn 10 Gr 80 Qtz 10	1.5 m Granite	Fast	N/A
RE99-74E-92-001	No Name by Johnstone Tower	532118 6378004	Moderate	Main Channel	Shallow Point	Between	No Drop	Sand/Silt >50	Loose	Matrix Support	N/A	N/A	Slow	N/A
RE99-74E-93-001	Marguerite River	556860 6383129	Moderate Good	Main Channel	Base of Rapids	Down stream	Drop <30 cm	Cobble 50-20 Pebble 50-20 Granule 50-20 Sand/Silt 50-20	Firm	Inter.	Gn 10 Gr 60 Qtz 30	1 m Granite	Fast	Glacial/ Fluvial Sands
RE99-74E-94-001	No Name	540945 6370215	Poor Moderate	Main Channel	Shallow Point	Between	No Drop	Sand/Silt >50	Loose	Matrix Support	N/A	N/A	Medium	N/A

Appendix 4b. 1999 Stream Sediment HMC Sample Results

Appendix 4b. 1999 stream sediment HMC sample results.

Sample Number	Easting	Northing	Garnet	Cpx	Opx	Chromite	Ilmenite	Au grains	Largest Au grain (micron)	Au grain description**	Notes
RE99-74E-03-002	464118	6334930	0	0	0	0	0	2	40X80	2-A	
RE99-74E-06-001	475047	6343820	0	0	0	0	0	6	40X60	5-A; 1-I	
RE99-74E-07-001	481050	6348900	0	0	0	0	0	1	40X40	A	
RE99-74E-08-001	490290	6355752	0	0	0	0	0/2*	5	40X100	3-I; 1-A/I; 1-I/D	
RE99-74E-09-001	495475	6346826	0	0	0	0	0	0			
RE99-74E-10-001	449075	6319655	0	0	0	0	0	0			
RE99-74E-11-001	453327	6328024	0	0	0	0	0/1	4	100X140	3-A; 1-A/I	
RE99-74E-12-001	453142	6329923	0	0	0	0	0	0			
RE99-74E-13-001	458730	6340669	0	0	0	0	0	3	100X140	2-A; 1-A/I	
RE99-74E-14-001	453311	6336186	0	0	0	0	0	0			
RE99-74E-15-001	446280	6334742	0	0	0	0	0/1	0			
RE99-74E-16-001	441457	6342900	0	0	0	0/1	0/2	0			
RE99-74E-17-001	453283	6343452	0	0	0	0/1	0	0			
RE99-74E-19-001	457259	6349748	0	0	0	0	0	0			
RE99-74E-20-001	456608	6355565	0	0	0	0/1	0	1	60X60	A	Excessive sulphides
RE99-74E-21-001	443825	6359678	0	0	0	0	0	0			
RE99-74E-22-001	440397	6351616	0	0	0	0	0/2	0			
RE99-74E-23-001	442929	6372897	0	0	0	0	0	0			Excessive sulphides
RE99-74E-24-001	460722	6369063	0	0	0	0	0/2	0			
RE99-74E-025-001	462745	6363296	0	0	0	0	0/3	0			
RR99-74E-26-001	480910	6369367	0	0	0	0	0	2	40X80	2-A	
RE99-74E-27-001	479029	6401348	0	0	0	0	0	0			
RE99-74E-28-001	489825	6387448	0	0	0	0	0/3	0			
RE99-74E-29-001	494146	6383198	0	0	0	0	0/3	0			
RE99-74E-30-001	494210	6383198	0	0	0	0/1	0/8	0			
RE99-74E-31-001	495267	6377545	0	0	0	0	0/3	0			
RE99-74E-32-001	493974	6375081	0	0	0	0	0/4	0			
RE99-74E-33-001	496371	6369931	0	0	0	0/2	0	0			
RE99-74E-34-001	502683	6369524	0	0	0	0	0/5	0			
RE99-74E-35-001	502155	6369397	0	0	0	0/1	0/3	0			
RE99-74E-36-001	501761	6364460	0	0	0	0	0	1	40X100	A/I	
RE99-74E-37-001	507737	6350143	0	0	0	0	0/5	1	40X40	A	
RE99-74E-38-001	510463	6357561	0	0	0	0/1	0/4	2	160X440	2-A	
RE99-74E-39-001	509520	6363072	0	0	0	0/1	0/6	0			
RE99-74E-40-001	499618	6386317	0	0	0	0	0	3	120X120	3-A	
RE99-74E-41-001	505157	6397018	0	0	0	0	0	0			
RE99-74E-42-001	512206	6394024	0	0	0	0	0	0			
RE99-74E-43-001	515181	6391613	0	0	0	0	0	0			
RE99-74E-44-001	465353	6372559	0	0	0	0	0/2	0			
RE99-74E-45-001	452075	6382222	0	0	0	0/1	0/6	2	120X120	2-I	
RE99-74E-46-001	452779	6387970	0	0	0	0	0	1	40X40	A	
RE99-74E-47-001	468937	6390666	0	0	0	0/1	0/3	0			
RE99-74E-48-001	445973	6413507	0	0	0	0	0/6	0			
RE99-74E-49-001	453297	6428457	0	0	0	0/1	0/4	0			
RE99-74E-50-001	462379	6422870	0	0	0	0	0	0			
RE99-74E-51-001	477993	6419311	0	0	0	0	0	0			
RE99-74E-52-001	486966	6422104	0	0	0	0	0/2	0			
RE99-74E-53-001	493813	6416060	0	0	0	0	0	0			
RE99-74E-54-001	473459	6319179	0	0	0	0/1	0	0			
RE99-74E-55-001	487120	6321336	0	0	0	0	0/3	0			
RE99-74E-56-001	486675	6325537	0	0	0	0/1	0/3	0			
RE99-74E-57-001	491232	6332027	0	0	0	0	0	0			
RE99-74E-58-001	493277	6342553	0	0	0	0	0	0			
RE99-74E-59-001	503014	6345201	0	0	0	0	0	0			
RE99-74E-60-001	523797	6318074	0	0	0	0	0	0			
RE99-74E-61-001	527723	6325551	0	0	0	0	0	0			
RE99-74E-62-001	513717	6423701	0	0	0	0	0/4	0			
RE99-74E-63-001	514794	6421049	0	0	0	0	0/6	0			
RE99-74E-64-001	528906	6416238	0	0	0	0	0/3	0			
RE99-74E-65-001	533549	6408354	0	0	0	0	0/4	0			
RE99-74E-66-001	543129	6409497	0	0	0	0	0/2	1	100X160	A	
RE99-74E-67-001	542849	6427910	0	0	0	0	0/4	0			
RE99-74E-68-001	542900	6427800	0	0	0	0	0	0			
RE99-74E-69-001	552100	6427853	0	0	0	0	0/4	0			
RE99-74E-70-001	557510	6424654	0	0	0	0	0/2	0			
RE99-74E-71-001	556430	6409378	0	0	0	0	0	0			
RE99-74E-72-001	555471	6402773	0	0	0	0	0/3	0			
RE99-74E-73-001	542502	6392416	0	0	0	0	0	0			
RE99-74E-74-001	548549	6383669	0	0	0	0/1	0	0			
RE99-74E-75-001	534861	6329498	0	0	0	0	0	0			
RE99-74E-76-001	543099	6325027	0	0	0	0	0	0			
RE99-74E-77-001	556750	6318900	0	0	0	0	0	0			
RE99-74E-78-001	552370	6330600	0	0	0	0	0	0			
RE99-74E-79-001	553527	6333766	0	0	0	0	0	0			
RE99-74E-80-001	550884	6344920	0	0	0	0	0	0			
RE99-74E-81-001	558526	6358626	0	0	0	0	0	0			

Appendix 4b. 1999 stream sediment HMC sample results.

Sample Number	Easting	Northing	Garnet	Cpx	Opx	Chromite	Ilmenite	Au grains	Largest Au grain (micron)	Au grain description**	Notes
RE99-74E-82-001	559889	6366853	0	0	0	0	0/1	0			
RE99-74E-83-001	534004	6352839	0	0	0	0	0/1	0			
RE99-74E-84-001	519915	6361954	0	0	0	0	0/3	0			
RE99-74E-85-001	498037	6368858	0	0	0	0/1	0/3	0			
RE99-74E-86-001	491647	6356389	0	0	0	0/1	0/2	0			
RE99-74E-87-001	521768	6355819	0	0	0	0	0	1	60X80	A	
RE99-74E-88-001	517625	6366955	0	0	0	0	0	0			
RE99-74E-89-001	502688	6384908	0	0	0	0	0	1	80X80	A	
RE99-74E-90-001	517602	6385265	0	0	0	0	0	1	60x60	A	
RE99-74E-91-001	525595	6379788	0	0	0	0	0/1	0			
RE99-74E-92-001	532118	6378004	0	0	0	0	0	0			
RE99-74E-93-001	556860	6383129	0	0	0	0	0/3	0			
RE99-74E-94-001	540945	6370215	0	0	0	0	0	0			
RE99-74E-96-027	459519	6338652	0	0	0	0	0	0			
RE99-74E-98-001	464446	6331825	0	0	0	0/9	0/4	0			
*	0/2 = Zero definite grains/two possible grains										
**	A = alluvial; I = irregular; D = delicate										

Appendix 5. Petrographic Descriptions from Selected Samples

APPENDIX 5. Petrographic descriptions from selected samples.

RE99-74E-85-005

Rock Name: Quartz sandstone
Texture: The rock consists of loosely packed subangular and angular detrital grains of quartz, up to 0.1 mm in size. Less common are minor muscovite flakes, feldspar and tourmaline. Detrital magnetite, ilmenite and anatase randomly occur as well. Carbonaceous clusters and wood particles randomly occur in the rock. Clastic grains make up about 40% of the rock volume, while cement about 60%.
The clastic grains are cemented by very fine-grained siderite. The siderite cement shows micritic texture, with subindividual crystal size of about 5 microns. The cement is subjected to sulphurization that induced dispersed crystallization of marcasite and pyrite.
Sulfide Mineralization: Most likely, sulfide mineralization is due to the cement siderite sulphurization in deep see waters enriched in H_2S. However, hydrothermal sulphurization of the rock by hot springs water is also possible.
Marcasite is the principal sulphide distributed in the cement. It is mostly acicular with the crystal length up to 0.1 mm. The marcasite crystals are frequently twinned and intergrown in bigger clusters of crosscutting slats. Marcasite shows typical, very strong anisotropy with colours varying form light grey-green to brown with a reddish hue.
Pyrite randomly replaces the carbonate cement. It occurs as irregularly shaped clusters, up to 1.0 mm in size. Some pyrite crystals show very weak optical anisotropy with colours varying from light brown to grey.

RE99-74E-85-008

Rock Name: Pyrite-marcasite nodule.
Structure/Texture: The nodule is developed within quartz sandstone due to total replacement, probably, of the carbonate cement. The first matter replacing the original cement is very fine-grained and black-coloured substance (it might be melnikovite?) that gradually recrystallizes to pyrite or marcasite. The nodule incorporates two concentric substructures growing one onto another. An internal nodule consists of pyrite infills intergranular spaces and fractures in the quartz grains. In the external nodule, marcasite is more common then pyrite. In some external parts of the nodule, fine-grained melnikovite is dominant between the clastic grains.
Marcasite is lathy in shape with the crystal size up to 0.1 mm. In majority of cases, the anisotropic color effect of marcasite is typical, ranging from yellow-green deeply to brown. However, some larger marcasite grains show atypical blue-sky to pinkish-yellow colours (see Plate #1). Their optical determinations were mistaken for arsenopyrite.

RE99-74E-85-010

Rock Name: Pyrite-marcasite nodule.
Structure/Texture: The mineral composition and texture of the nodule are almost identical to the Nr. 85-008. This nodule also consists of two concentric substructures growing one onto another, and their sequence of mineralization is similar. In the external part of the nodular structure, however, marcasite shows more euhedral development than in sample 85-008. Among detrital grains, carbonaceous wood fragments are frequent.
Marcasite is commonly subhedral, fine-grained with the crystal size up to 0.1 mm. In the most external area of the nodule, marcasite is sometimes euhedral (see Plate #2, Figs. C and D). Very strong anisotropic effects include the green colours (see Plate #5) that exclude doubt of misidentification for arsenopyrite.
Pyrite, in the center part of the nodule, replaced totally the intraclastic cement. Against the clastic grains, pyrite is anhedral. It shows typical optical properties.

Remark: The powder-like, black substance among sulfides, most likely is not a carbon but melnikovite (cryptocrystalline variety of the iron sulfide).

RE99-74E-95-003

Rock Name: Sandstone.
Texture/Mineralogy: The rock is composed of subangular to angular clastic grains of quartz and subordinate amount of chert, microcline, plagioclase and mica, up to 0.2 mm in size. The grains are well sorted, loosely packed and cemented by fine-grained siderite. The average cement content makes up about 50% of the volume. Carbonaceous particles and wood particles, up to 0.5 mm in size occur in the rock as well.
Cementing siderite shows the grain size up to 10 microns. The deep limonitization of the siderite crystals is ubiquitous.
Many clastic grains are elongated in the bedding plane. Thin fissures (structural porosity), parallel to the bedding, commonly occur in the rock. They are empty or infilled with goethite and limonite. Voids, up to 0.3 mm in size are ubiquitous in the rock.
Rounded nodular clusters of sulfides, up to 5 mm in size, randomly occur in the rock (see Plate #3, Fig. A).
Quartz, which is the chief detrital constituent, most likely comes from diversified original sources, as suggested by the type of inclusions. Some quartz grains contain exclusively solid inclusions of rutile, others are full of liquid inclusions or are clean.
Sulfide Mineralization: The cores of nodules are infilled with pyrite that replaced other minerals, including quartz. Around cores, in the rims, sulfides have been developed in the cement between detrital grains. The rim sulfides consist of intergrowing pyrite and marcasite. Their grain size is up to 0.1 mm.
Marcasite, having lamellar twinning, blue-sky anisotropic colours and reflection pleochroism with a pale red-violet tint (see Plate #3, Figs. B, C and D). These characteristics are also typical of arsenopyrite. During preliminary optical examination marcasite was mistaken for arsenopyrite.

RE99-74E-96-003

Rock Name: Fossiliferous (foraminiferal) ooze.
Texture: The rock is micro fossiliferous limestone containing chiefly foraminiferal, bryozoa and sponge organisms. Conodonts are included in the rock as well. Mineralogically, it consists mainly of micrite-textured calcite (see Plate #6, Fig. A). Some subordinate amount of the dusty clay substance is commonly distributed along the rock. From the grain size, the rock can be classified as calcilutite, with calcite particles about 10 microns in size. No detrital grains or mineralization phenomena have been noticed in the rock.
The origin of the rock is due to deep-sea pelagic sedimentation.

RE99-74E-96-005 & RE99-74E-96-006

Rock Name: Silty claystone.
Texture/Mineralogy: The rock groundmass consists chiefly of smectite group minerals and dust impurities, up to 20 microns in size. The silty-sized particles of quartz and mica make up less then 10% of the volume, and are distributed in the clay groundmass. Along the bedding plane, irregularly shaped fissures and voids, about 0.2 mm in width, are developed in the rock. Close to the fissures, the smectite groundmass is clean and free of the dusty substance. Along some fissures, the clay groundmass is partly rusty. However, it is not clear if the rust is due to smectite oxidation or from external impregnation.

RE99-74E-96-014 & RE99-74E-96-015

Rock Name: Micaceous silty claystone.
Texture/Mineralogy: Smectite is the main component in the groundmass. The groundmass also contains angular to subangular detrital grains of quartz and oxidized biotite (or phlogopite?) that are up to 0.05 mm in size. Uncommonly, in larger grains of quartz solid rutile inclusions occur. Fluid inclusions were not found. The proportion of silt-size particles to smectite clay are about 1:3. Weak pleochroism is noticeable in some mica grains. Randomly, clusters of a fine-grained, strongly oxidized ferruginous carbonate are included in the rock. The mica grains display parallel orientation along the bedding plane. Structural porosity, fissures and irregular voids are common in the rock.

RE99-74E-96-026

Rock Name: Pyritized quartz sandstone.
Structure/Texture: The sample shows turbidite flow structures and psammitic texture. In some parts of the sample, bedding is well visible. Between flow structures, structural porosities randomly occur.
The subangular to subrounded quartz, up to 2 mm in size, is loosely packed and cemented by pyrite. Due to strong pyritization, the original cement was not preserved. On pore borders, in the fine-grained melnikovite, tiny crystals of **marcasite** are rarely noticeable. Sulfide minerals are well preserved. No trace of oxidation was found.
Pyrite, in the center part of the nodule, totally replaced the cement. Against the clastic grains, pyrite is anhedral. It shows typical optical properties.

RE99-74E-96-REF1

Rock Name: Siderite (or Iron carbonate rock).
Texture/Mineralogy: The rock is entirely composed of a microcrystalline iron carbonate. The carbonate crystals, 0.3 to 0.5 mm in size, are interlocked and anhedral to subhedral in shape. The rock is randomly porous and fractured. Along fractures, the carbonate grains are strongly oxidized. Minute, euhedral crystals of pyrite, up to 0.2 mm in size, are distributed near fractures and pores. Among carbonates, also fine-grained detrital quartz occurs.
Evidently, the carbonate oxidation and initial sulphurization (pyrite) is structurally controlled, e.g., related to the fractures and porosity.

RE99-74E-96-REF2

Rock Name: Iron Carbonate (radially textured).
Texture/Mineralogy: The rock consists of an iron carbonate, which form fibrous, radiating domains. The domains, polygonally interlocked, are rounded in shape, about 0.5 mm in size. Their sizes are highly equalized. Commonly, between radial domains, irregularly shaped pores occur. Minute crystals of secondary quartz, up to 0.03mm in size, are ubiquitous in the pores. Exceptionally, secondary quartz grains are up to 0.3 mm in size. Fluid inclusions with gas bubbles have been found in the quartz.
Minute grains of pyrite unfrequently occur in carbonate crystals as well.
Remark*:* In pores, secondary quartz might be of low temperature hydrothermal origin, but sulfide mineralization has not been found.

RE99-74E-99-003

Rock Name: Pyritized Quartz Sandstone.
Texture/Mineralogy: The rock consists of clastic grains, which are cemented by secondary pyrite. The clastic grains are mainly angular to subangular, about 0.3 mm in size. The quartz clasts make up more

than 95% of the grains. Minor detrital feldspar, mica, tourmaline, epidote and probably staurolite are included as well. Intraclastic, anhedral pyrite is, most likely, a secondary component after a ferrugineous carbonate (?). It is locally oxidized to goethite (see Plate #4, Fig. D). In polarized light, pyrite shows weakly but distinctive anisotropy with grey and pink-brown colours. According to Schneiderhöhn, the atypical anisotropy occurs frequently in arseniferous pyrite. However, during microprobing tests of Glen de Paoli, it was shown that despite optical anisotropy, this pyrite is free of arsenic.

RE99-74E-99-004

Rock Name: Botryoidal Goethite.
Texture/Mineralogy: The rounded grains of goethite, about 0.02 mm in size, are distributed within a fine-grained smectite groundmass. The goethite grains are evidently pseudomorpic after siderite crystals. Gradually, the granular structure changes in colloform masses of botryoidal goethite arranged along the rock stratification. Replacement of siderite by goethite seems to be caused by weathering.

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