

**METALLIC MINERAL DEPOSITS AND OCCURRENCES IN THE
PHANEROZOIC SUCCESSION NORTH OF LATITUDE 55°N, ALBERTA**

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1.0 INTRODUCTION

The geological setting of Phanerozoic rocks in northern Alberta is similar to many productive metalliferous districts in the world, where formation or emplacement of mineral deposits is often controlled, in part, by coeval volcanism and extensional faults or fracture zones associated with regional fault systems, arches and other structural zones that transect overlying Phanerozoic cover rocks. Selected examples, include: Early Cambrian marine black shale Ni-Mo deposits of south China (Fan, 1983; Coveney and Chen Nansheng, 1991); Ni-Zn stratiform mineralization in the Devonian marine black shales of the Nick Basin, Yukon, Canada (Hulbert, 1996); highly brecciated, Middle Devonian dolomite-hosted Zn-Pb deposits at Pine Point, North West Territories, Canada (Sangster, 1996); Ordovician through Lower Mississippian Carlin Trend Au deposits in Nevada, United States (Teal and Jackson, 1997); and the late Permian, Kupferschiefer-type Cu shales in Poland (Oszczepalski, 1989). In addition, a compilation by Pašava (1993), reported the presence of platinum group element accumulations from marine black shales of China, Canada, United States, Czech Republic, Finland, Poland and Russia. The metal-bearing, sedimentary deposits are often characterized by unique metal associations, extensive lateral distribution, persistent metal grade, mineralogical makeup, and stratigraphic control that provide the economic geologist with a number of conceptual models for mineral exploration in basin environments, including the Western Canada Sedimentary Basin.

Recent (1990's), minerals exploration and geological studies in the Phanerozoic succession of northern Alberta have documented anomalous amounts of Au, Ag, Pt, Pd and several base metals that exist, at least locally, in the Cretaceous, Jurassic and Devonian strata of northern Alberta. Potential also exists for economic concentrations of co-product metals, such as Ti, Zr, Al, Cr and Au from oil sand tailings, and V and Au from the Clear Hills Iron Deposits. Subsequent interest by local, national and international companies have requested a uniformly organized and up-to-date collation of information on mineral occurrences in the Province of Alberta. The objective of this synthesis is to highlight geological anomalies and target areas from previous geological studies and minerals exploration of the Phanerozoic strata north of Latitude 55°N, Alberta. The compilation does not include mineral occurrences previously documented in the Helikian-, Aphebian- and Archean-aged rocks, or the areas underlain by the exposed Precambrian Shield and Athabasca Group sandstone.

2.0 METHODOLOGY AND FORMAT

Metallic mineral deposits and occurrences in the Phanerozoic strata north of Latitude 55°N, Alberta, are summarized from: (1) a regional metallogenic evaluation of Alberta that reviews Alberta Energy Assessment File Reports, Geological Survey of Canada and Alberta Geological Survey reports, miscellaneous journals, university thesis and numerous publications (Olson *et al.*, 1994); (2) a study to analyze existing Paleozoic core data for anomalous Pb-Zn mineralization (Turner and McPhee, 1994); (3) a compilation of the placer gold occurrences in Alberta (Edwards, 1990); (4) a mineral potential study in the Marguerite River area (Dufresne *et al.*, 1994); and (5) recent mineral discoveries by industry made public through news releases and assessment file reports.

The mineral deposits and occurrences are documented in Section 6.0 by:

Anomaly Number

A random number assigned to the mineral deposit or occurrence that may be located on Figure 1 for visual reference.

AGS ID

An internal number assigned by the Alberta Geological Survey (AGS) referencing both the AGS publication and the identifier used by the specific publication.

Location

The best possible location is given in both 10° Transverse Mercator (10TM with Central Meridian = 115° West Of Greenwich), and Universal Transverse Mercator (UTM) coordinates.

Type of Anomaly

Throughout this report, mineralized anomalies are referred to either as: (a) a *mineral deposit* if tonnage and grade figures are known, or (b) a *mineral occurrence* if tonnage and grade figures are absent. No attempt has been made to set lower limits for deposit and occurrence sizes.

Placer gold occurrences are defined as geochemical anomalies and only include occurrences with concentrations greater than 10 ppb Au, 50 mg/cu yd Au or 30 grains/pan. As a supplement to the metallic mineral deposits and occurrences, Section 7.0 includes a summary of the occurrences of placer gold with concentrations of less than 10 ppb Au, 50 mg/cu yd, or 30 grains/pan in northern Alberta.

Summary

Provides a brief summary for each mineral deposit or occurrence including: (1) the approximate location; (2) the extent of exploration; and (3) a description of the mineralization encountered and associated geochemical data. No attempts at interpreting the data are included and more detailed information including geochemistry may be accessed through the references.

Reference(s)

These include published sources. For published and assessment report information the reader should obtain desired material directly from the source.

NOTE: The deposit and occurrence data and accompanying map are intended to be active documents that can be updated as new information becomes available. Revisions of the publication are anticipated and any additional published and/or unpublished information may be forwarded to the Manager, Alberta Geological Survey.

3.0 GEOLOGY OF THE PHANEROZOIC STRATA IN NORTHERN ALBERTA

The undeformed portion of the Western Canada Sedimentary Basin (WCSB) beneath the Interior Plains can be viewed as a simple wedge of Phanerozoic strata overlying the Precambrian crystalline basement. The wedge, consisting of carbonate, evaporite and clastic rocks, tapers from a maximum thickness of about 6000 m in the axis of the Alberta Syncline just east of the Foothills, to a zero-edge in the northeast along the Canadian Shield.

The WCSB can be divided into two distinct parts, reflecting sedimentation in two profoundly different tectonic settings: (1) a Paleozoic to Jurassic platformal succession dominated by carbonate rocks that were deposited predominantly from source areas in the east on the stable craton adjacent to the passive margin of North America; and (2) the overlying mid-Jurassic to Paleocene foreland basin succession dominated by clastic rocks that were deposited from predominantly westerly source areas during the active margin orogenic evolution of the Canadian Cordillera.

The Phanerozoic strata north of Latitude 55°N, Alberta, is comprised dominantly of Devonian, Cretaceous and Tertiary rocks. The Paleozoic strata are characterized by Middle and Upper Devonian carbonate rocks with marine shale and evaporites. The exposed thickness of the Devonian rocks in northeast Alberta is about 700 m, but in the subsurface to the west they reach a total thickness of up to about 1175 m or greater. Major unconformities occur below the base of the Cambrian, Middle Devonian and near the top of the Pennsylvanian.

Cretaceous rocks exist in outcrop or in subcrop beneath Quaternary drift over greater than two-thirds of Alberta. In the northeastern Plains, Lower Cretaceous marine to deltaic clastic sedimentary rocks (Manville Group) unconformably overlie Paleozoic strata. To the south and west, the Lower Cretaceous strata are conformably overlain by Upper Cretaceous marine to continental clastic sedimentary rocks. In northern Alberta, the exposed Upper Cretaceous strata are up to about 900 m thick. In central and northwestern Alberta, Paskapoo Formation conformably overlies various Upper Cretaceous rock units and obtains a maximum thickness of 850 m.

Regional overviews of the Paleozoic, Mesozoic and Cenozoic strata in the WCSB and the Cordilleran Orogen in Alberta, are provided by McCrossan *et al.* (1966), Mossop and Shetsen (1994), Ricketts (1989), and Stott and Aiken (1993).

4.0 PREVIOUS MINERAL POTENTIAL STUDIES AND EXPLORATION SUMMARY

Historically, mineral exploration in the Phanerozoic strata north of Latitude 55°N, Alberta, has been virtually non-existent. Thus, mining operations are also limited and confined to small scale deposits. In the late 1950's, sedimentary oolitic iron deposits at the Clear Hills district were discovered and extensively explored through to the mid-1970's.

The Clear Hills iron deposits comprise an oolitic iron- and silica-rich facies of the Bad Heart

Formation sandstone of Late Cretaceous (Late Coniacian) age in northwestern Alberta. The oolitic iron deposit crops out along the southern and northeastern flanks of the Clear Hills and ranges in thickness from about 9 m thick in the northeast, thinning to zero metres in the west (Hamilton, 1980). Total resources in the 'proven', 'probable' and 'possible' categories have been estimated at over 1 billion tonnes grading about 32 to 35 per cent iron (%) and 20 % silica (Kidd, 1959; Bertram and Mellon, 1975). However, the relatively low grades, and the complex ore mineralogy, have prevented development to date.

During the 1960's to early 1980's, several companies attempted to evaluate Cretaceous and Tertiary sedimentary rocks of the Phanerozoic basin for a variety of sediment-hosted uranium deposits similar to those present in the United States. Edmond (1970) considered that elevated concentrations of Zn, Pb, Ni, V, As, Cu and Mo were potential pathfinder elements for sandstone-hosted uranium deposits similar to those of the Colorado Plateau. However, there is no evidence that any follow-up work was performed.

More recently, changes to the Alberta mining act allowing companies to paper stake large tracts of land with Government-issued two-year exploration permits; and the completion of the Canada-Alberta Agreement on Mineral Development (1992-1995) have promoted mineral exploration in the mid-Cretaceous sedimentary marine environment of northern Alberta.

One area that has generated a lot of interest is the Alberta oil sand reserves, which have been estimated at $1,674 \times 10^9$ barrels; a vast resource compared to total world conventional oil reserves of $1,093 \times 10^9$ barrels. Heavy minerals present in the oil sands are selectively enriched as they pass through the bitumen-recovery process used by Suncor and Syncrude and are expelled in the tailings from the centrifuge stage. Potential co-products of the oil sands includes rutile, synthetic rutile, titanium pigment, zircon, tourmaline, monazite, garnet, aluminum, gold, platinum group elements, and base metals. A Fort McMurray titanium facility would produce 288,000 tonnes of Ti concentrate annually from the oil sand centrifuge tailings streams and would rank as the second largest facility of its type in Canada - and the world's ninth-largest titanium producer (Alberta Chamber of Resources, 1997). Further work has been recommended on the basis of a low-cost world scale resource, acceptable but not optimized recovery and grade, and perceived market demand.

Exploration companies have also focused on the mid-Cretaceous sediments and Devonian carbonates, which represent a favorable environment for the emplacement of several deposit types including: sedimentary exhalative sulphide (Sedex); sedimentary Ni sulphides; stratabound sandstone U and Pb; sediment-hosted stratiform Cu; epithermal (Carlin-type) Au; residually enriched deposits; and placer concentrations. The factors that promote these mineral deposit models include the associations of: (1) a sedimentary basin that may have developed in a tectonically active environment; (2) magmatic activity including ultramafic diatremes and bentonitic horizons that are contemporaneous with sedimentation - the latter may, or may not, be deposited locally; (3) stratigraphic distribution of chemical sediments such as Ba, which may represent a syngenetic hydrothermal precipitate, (4) sandstones with permeability contrasts such as shale beds; (5) a presence of reductants, including coal zones; and the presence of channels of sandstone at the periphery of the sedimentary basin; (6) a presence of phosphates, which is often indicative of the potential for other deposit types such as U, V, REE and

sedimentary Ni sulphide; and (7) evaporite deposits in large basins, which are, in general, laterally associated with sandstone-hosted Cu, U and V, and Pb-Zn±Ag Sedex deposits (Eccles *et al.*, 1998; Olson *et al.*, 1994).

5.0 REFERENCES

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6.0 METALLIC MINERAL DEPOSITS AND OCCURRENCES IN THE PHANEROZOIC SUCCESSION OF NORTHERN ALBERTA

- Anomaly No.: **1**
AGS ID: 74D-1 (Olson *et al.*, 1994)
10TM (UTM): 729967E, 6285380N (485044E, 6281618 - Zone 12)
Type of anomaly: Mineral occurrence
Summary: A solid cleavable mass of enargite with minor calcite and malachite was located about 6.4 km southeast of Fort McMurray on the banks of the Clearwater River (LaCasse and Roebuck, 1978). The copper arsenic sulphide may be associated with hydrothermal Cu deposits.
Reference(s): LaCasse, L.J. and Roebuck, J. 1978. Minerals of Alberta. Hallamshire Publishers, Edmonton, Alberta, 59 p.
- Anomaly No.: **2**
AGS ID: 74D-2 (Olson *et al.*, 1994)
10TM (UTM): 735319E, 6285952N (490419E, 6281876 - Zone 12)
Type of anomaly: Mineral occurrence
Summary: A minor occurrence of enargite located southeast of Fort McMurray on the banks of the Clearwater River (LaCasse and Roebuck, 1978).
Reference(s): LaCasse, L.J. and Roebuck, J. 1978. Minerals of Alberta. Hallamshire Publishers, Edmonton, Alberta, 59 p.
- Anomaly No.: **3**
AGS ID: 74D-3 (Olson *et al.*, 1994)
10TM (UTM): 755218E, 6286620N (510316E, 6281383 - Zone 12)
Type of anomaly: Mineral occurrence
Summary: A minor occurrence of enargite located east of Fort McMurray on the banks of the Clearwater River (LaCasse and Roebuck, 1978).
Reference(s): LaCasse, L.J. and Roebuck, J. 1978. Minerals of Alberta. Hallamshire Publishers, Edmonton, Alberta, 59 p.
- Anomaly No.: **4**
AGS ID: 74D-4 (Olson *et al.*, 1994)
10TM (UTM): 803056E, 6291835N (558352E, 6283796 - Zone 12)
Type of anomaly: Mineral occurrence
Summary: Galena occurs as a cavity filling in porous, buff coloured dolomite of the Methy Formation near Whitemud Falls, Clearwater River (Carrigy, 1959). It was thought to have formed as a result of dolomitization of organic remains.
Reference(s): Carrigy, M.A. 1959. Geology of the McMurray Formation. Research Council of Alberta, Alberta Geological Survey, Memoir No. 1.
- Anomaly No.: **5**
AGS ID: 74E-26 (Olson *et al.*, 1994)
10TM (UTM): 707430E, 6332949N (465331E, 6330410N - Zone 12)
Type of Anomaly: Mineral occurrence

Summary:

In 1911 and 1912, quartz veins hosted by Devonian Methy Formation limestone were intersected in Athabasca Oils Ltd. No. 1 at a depth of 276.5 m (Allan, 1920; Halferdahl, 1986). The sample, which was analyzed in 1912, yielded \$13.00/ton Au over an interval of 8 m. This is equivalent to 21.6 g/t Au based on the price of gold at that time. During 1962 and 1963, four holes drilled in the approximate vicinity by Scurry-Rainbow Oil Ltd., yielded only trace amounts of Au (Elstone, 1963). During 1986, Tanner Arctic Oil Ltd. drilled one hole approximately 1.3 km south of the site of Athabasca Oils Ltd. No 1 well with analysed samples yielding low Au results (Halferdahl, 1986). In 1986, Kenneth Richardson drilled two holes on the east side of the Athabasca River, south of the Fort MacKay bridge and approximately 35 km south of the reported location for the Athabasca Oils Ltd. No. 1 well. A sample obtained from Methy Formation carbonates with a few specks of chalcopyrite and malachite from drill hole 86-2R at a depth of 241 m, yielded 2.16 g/t Au (Halferdahl, 1986). A sample collected at 318.2 m from drill hole 86-1R yielded 30 ppb Au. In 1993, Ells Gold 1 was drilled in close proximity to Athabasca Oils Ltd. No. 1, and penetrated the Precambrian basement at 274 m. One sample of quartz with abundant pyrite assayed 1.1 g/t Au, 7.54 g/t Ag, 2,677 ppm As, 215 ppm Cu, 8 ppm Sb and 5.64 wt% Fe, and two other samples assayed 0.21 g/t Au (Puckett, 1994).

Reference(s):

Allan, J.A. 1920. The mineral resources of Alberta. Research Council of Alberta, Report No. 1.
Elstone, E.F. 1963. A memorandum reports on the Athabasca gold project of Scurry-Rainbow Oil Ltd. Scurry Rainbow Oil Ltd., 11 p.
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Puckett, D. 1994. Metallic and Industrial Mineral Assessment Report on the Ellis River property. Alberta Geological Survey Economic Minerals File Report 19930001, 15 p.

Anomaly No.:

6

AGS ID:

74E-31 (Olson *et al.*, 1994)

10TM (UTM):

514654E, 6371623N (514808E, 6371674 - Zone 12)

Type of anomaly:

Geochemical anomaly

Summary:

A weakly anomalous zone was identified by ground I.P. beneath the SW end of a small lake approximately 10 km north of the Firebag River and about 34 km east of McClelland Lake. A small number of geochemical samples were collected from sand and/or "organic" material and assayed up to 10 ppm Pb, 150 ppm Zn and 22 ppm Hg (Goettler, 1969). The exact number of samples is not specified. A single drill hole did not encounter any mineralization.

Reference(s):

Goettler, G.W. 1969. Government of Alberta Quartz Mineral Exploration Permit Nos. 14 and 15 - Field Work Report. C.C. Huston and Associates. Alberta Research Council Economic Minerals File Report No. PB-AF-002(3). Toronto, Ontario.

Anomaly No.: **7**
AGS ID: 83M-1 (Olson *et al.*, 1994)
10TM (UTM): 230885E, 6166736N (356738E, 6163260 - Zone 11)
Type of anomaly: Mineral occurrence
Summary: Likely an occurrence of sphalerite observed in drill cuttings from B.A. Saddle River Well No. 11-23-76-9W6 (Dubord, 1987).
Reference(s): Dubord, M. 1987. Carbonate hosted Pb-Zn potential of northeastern Alberta and the application of petroleum data for mineral exploration. Alberta Research Council, Alberta Geological Survey, Open File Report 1987-07, 42 p.

Anomaly No.: **8**
AGS ID: 83M-2 (Olson *et al.*, 1994)
10TM (UTM): 207176E, 6209671N (331806E, 6205480 - Zone 11)
Type of anomaly: Mineral occurrence
Summary: Likely an occurrence of sphalerite observed in drill cuttings from BP Ethyl Whitburn No. 7-3 (Dubord, 1987).
Reference(s): Dubord, M. 1987. Carbonate hosted Pb-Zn potential of northeastern Alberta and the application of petroleum data for mineral exploration. Alberta Research Council, Alberta Geological Survey, Open File Report 1987-07, 42 p.

Anomaly No.: **9**
AGS ID: 83M-3 (Olson *et al.*, 1994)
10TM (UTM): 212197E, 6146348N (338650E, 6142347 - Zone 11)
Type of anomaly: Mineral occurrence
Summary: Likely an occurrence of sphalerite observed in drill cuttings from a well collared about 8.5 km north of Hythe in west-central Alberta (Edmond, 1970).
Reference(s): Edmond, B.A. 1970. Report on the Grande Prairie Exploration Permits, Alberta - an exploration venture for sandstone-type uranium mineralization in the western Alberta basin. International Mine Services Limited. Alberta Research Council Economic Minerals File Reports Nos. U-AF-101(1), U-AF-103(1), U-AF-104(1), U-AF-105(1) AND U-AF-106(1). Toronto, Ontario.

Anomaly No.: **10**
AGS ID: 83M-4 (Olson *et al.*, 1994)
10TM (UTM): 249026E, 6134337N (375800E, 6131403 - Zone 11)
Type of anomaly: Mineral occurrence
Summary: Disseminated sphalerite and chalcopyrite were observed in interbedded sandstone and shale units at 124.97 to 134.11 m and coarse-grained, calcareous and carbonaceous sandstone at 167.64 to 170.69 m in drill hole Merrill Calvin Charter Scurry Grande Prairie No. 4-14 located about 5.5 km north of Bear Lake and about 12.5 km west-southwest of Sexsmith, Alberta (Edmond, 1970). Samples assayed 400 ppm Ni over 9.14 m and 100 ppm U

over 3.05 m.
Reference(s): Edmond, B.A. 1970. Report on the Grande Prairie Exploration Permits, Alberta - an exploration venture for sandstone-type uranium mineralization in the western Alberta basin. International Mine Services Limited. Alberta Research Council Economic Minerals File Reports Nos. U-AF-101(1), U-AF-103(1), U-AF-104(1), U-AF-105(1) AND U-AF-106(1). Toronto, Ontario.

Anomaly No.: **11**
AGS ID: 83M-5 (Olson *et al.*, 1994)
10TM (UTM): 270383E, 6127813N (397332E, 6125496 - Zone 11)
Type of anomaly: Mineral occurrence
Summary: Sphalerite, galena, chalcopyrite and loellingite were all observed in cuttings from drill hole Imperial Clairmont #1 located about 8.5 km east of the north end of Clairmont Lake and about 16 km northeast of Grande Prairie. The sulphides occur in siltstone at a depth of 64.01 to 67.06 m (Edmond, 1970). Samples collected over a 3.05 m intersection yielded 2000 ppm Zn and 100 ppm Pb.

Reference(s): Edmond, B.A. 1970. Report on the Grande Prairie Exploration Permits, Alberta - an exploration venture for sandstone-type uranium mineralization in the western Alberta basin. International Mine Services Limited. Alberta Research Council Economic Minerals File Reports Nos. U-AF-101(1), U-AF-103(1), U-AF-104(1), U-AF-105(1) AND U-AF-106(1). Toronto, Ontario.

Anomaly No.: **12**
AGS ID: 83M-6 (Olson *et al.*, 1994)
10TM (UTM): 282089E, 6117382N (409332E, 6115406 - Zone 11)
Type of anomaly: Mineral occurrence
Summary: Drill hole Plymouth Pan-Am Bezanson, located about 23.5 km due east of Grande Prairie, Alberta, intersected loellingite over a 6.1 m interval of carbonaceous, silty sandstone at a depth of 286.51 to 289.61 m (Edmond, 1970). One sample yielded values of 100 ppm U and 400 ppm V.

Reference(s): Edmond, B.A. 1970. Report on the Grande Prairie Exploration Permits, Alberta - an exploration venture for sandstone-type uranium mineralization in the western Alberta basin. International Mine Services Limited. Alberta Research Council Economic Minerals File Reports Nos. U-AF-101(1), U-AF-103(1), U-AF-104(1), U-AF-105(1) AND U-AF-106(1). Toronto, Ontario.

Anomaly No.: **13**
AGS ID: 83M-7 (Olson *et al.*, 1994)
10TM (UTM): 291860E, 6100595N (419579E, 6098907 - Zone 11)
Type of anomaly: Mineral occurrence
Summary: Pyrite and/or marcasite were observed in cuttings from a unit of bentonitic and carbonaceous sandstone at a depth of 356.61 to 362.71 m in drill hole

Stanolind Economy Creek #B-1 located about 11.5 km south-southeast of the confluence of the Smoky and Wapiti Rivers (Edmond, 1970). A sample collected from 6.1 m of cuttings assayed 100 ppm U and 200 ppm V.

Reference(s): Edmond, B.A. 1970. Report on the Grande Prairie Exploration Permits, Alberta - an exploration venture for sandstone-type uranium mineralization in the western Alberta basin. International Mine Services Limited. Alberta Research Council Economic Minerals File Reports Nos. U-AF-101(1), U-AF-103(1), U-AF-104(1), U-AF-105(1) AND U-AF-106(1). Toronto, Ontario.

Anomaly No.: **14**

AGS ID: 83M-8 (Olson *et al.*, 1994)

10TM (UTM): 288686E, 6178557N (414166E, 6176741 - Zone 11)

Type of anomaly: Mineral occurrence

Summary: An occurrence of ferruginous beds are present in members of the Wapiabi Formation near the town of Wanham and are documented as part of the “south of Peace River” iron occurrences (Kidd, 1959). The ferruginous beds south of the Peace River locally form minor scarps that extend eastward from the vicinity of Spirit River to the Smoky River. Directly south of the town of Spirit River the ironstone is approximately 4.5 m thick, and thickens to the east- southeast to 7.6 m at the Smoky River (Rutherford, 1930).

Reference(s): Kidd, D.J. 1959. Iron occurrences in the Peace River region, Alberta. Research Council of Alberta, Alberta Geological Survey, Preliminary Report 59-03, 38 p.

Rutherford, R.L. 1930. Geology and water resources in parts of the Peace River and Grande Prairie districts, Alberta. Research Council of Alberta, Report 21, 68 p.

Anomaly No.: **15**

AGS ID: 83M-9 (Olson *et al.*, 1994)

10TM (UTM): 257905E, 6184916N (383218E, 6182208 - Zone 11)

Type of anomaly: Mineral occurrence

Summary: An occurrence of ferruginous beds are present in members of the Wapiabi Formation near the town of Spirit River and are documented as part of the “south of Peace River” iron occurrences (Kidd, 1959). The ferruginous beds south of the Peace River locally form minor scarps that extend eastward from the vicinity of Spirit River to the Smoky River. Directly south of the town of Spirit River the ironstone is approximately 4.5 m thick, and thickens to the east- southeast to 7.6 m at the Smoky River (Rutherford, 1930). The Bad Heart Formation sandstone at Spirit River is similar petrographically to the lower part of the ferruginous sandstone in the “southern Clear Hills iron occurrences”, and is comprised of up to 85% detrital quartz grains and 10% oolites, probably goethite (Kidd, 1959).

Reference(s): Kidd, D.J. 1959. Iron occurrences in the Peace River region, Alberta. Research Council of Alberta, Alberta Geological Survey, Preliminary Report 59-03, 38 p.

Rutherford, R.L. 1930. Geology and water resources in parts of the Peace River and Grande Prairie districts, Alberta. Research Council of Alberta, Report 21, 68 p.

Anomaly No.: **16**
AGS ID: 83M-10 (Olson *et al.*, 1994)
10TM (UTM): 271471E, 6201230N (396305E, 6198905 - Zone 11)
Type of anomaly: Mineral occurrence
Summary: Reddish-brown oolitic sandstones were observed above the Peace River near the Dunvegan Ferry on Highway 2 and are documented as part of the “Dunvegan, Peace River” iron occurrences (Kidd, 1959). The sandstone located near the top of the Dunvegan Formation varies in thickness from 0.3 to 3.0 m and outcrop discontinuously for approximately 24 km (Kidd, 1959).
Reference(s): Kidd, D.J. 1959. Iron occurrences in the Peace River region, Alberta. Research Council of Alberta, Alberta Geological Survey, Preliminary Report 59-03, 38 p.

Anomaly No.: **17**
AGS ID: 83N-1 (Olson *et al.*, 1994)
10TM (UTM): 321559E, 6160969N (447532E, 6160108 - Zone 11)
Type of anomaly: Mineral occurrence
Summary: An occurrence of ironstone on the north bank of the Smoky River approximately 38 km east of Wanham and documented as part of the “south of Peace River” iron occurrences (Kidd, 1959). The Bad Heart Formation forms an escarpment, which extends eastward from the vicinity of Spirit River to the Smoky River. Just south of the town of Spirit River the ironstone is approximately 4.5 m thick, and thickens to the east-southeast to 7.6 m at the Smoky River (Rutherford, 1930). Dawson (1881) sampled the ironstone near the Smoky River and reported assays of 30.98 % iron.
Reference(s): Dawson, G.M. 1881. Report on an exploration from Port Simpson on the Pacific coast to Edmonton, on the Saskatchewan, embracing a portion of the northern part of British Columbia and the Peace River country. Geol. Nat. Hist. Surv. Can., Rept. Prog. 1879-1880, pt. B, pp. 1-177.
Kidd, D.J. 1959. Iron occurrences in the Peace River region, Alberta. Research Council of Alberta, Alberta Geological Survey, Preliminary Report 59-03, 38 p.
Rutherford, R.L. 1930. Geology and water resources in parts of the Peace River and Grande Prairie districts, Alberta. Research Council of Alberta, Report 21, 68 p.

Anomaly No.: **18**
AGS ID: 83N-2 (Olson *et al.*, 1994)
10TM (UTM): 314703E, 6174563N (440286E, 6173499 - Zone 11)
Type of anomaly: Mineral occurrence
Summary: An occurrence of ironstone approximately 15 km north of the Smoky River and 24 km east of Wanham and documented as part of the “south of Peace

River” iron occurrences (Kidd, 1959). The Bad Heart Formation forms an escarpment, which extends eastward from the vicinity of Spirit River to the Smoky River. Just south of the town of Spirit River the ironstone is approximately 4.5 m thick, and thickens to the east-southeast to 7.6 m at the Smoky River (Rutherford, 1930). Dawson (1881) sampled the ironstone near the Smoky River and reported 30.98 % iron.

Reference(s): Dawson, G.M. 1881. Report on an exploration from Port Simpson on the Pacific coast to Edmonton, on the Saskatchewan, embracing a portion of the northern part of British Columbia and the Peace River country. Geol. Nat. Hist. Surv. Can., Rept. Prog. 1879-1880, pt. B, pp. 1-177.
Kidd, D.J. 1959. Iron occurrences in the Peace River region, Alberta. Research Council of Alberta, Alberta Geological Survey, Preliminary Report 59-03, 38 p.
Rutherford, R.L. 1930. Geology and water resources in parts of the Peace River and Grande Prairie districts, Alberta. Research Council of Alberta, Report 21, 68 p.

Anomaly No.: **19**
AGS ID: 83N-3 (Olson *et al.*, 1994)
10TM (UTM): 319447E, 6181372N (444833E, 6180442 - Zone 11)
Type of anomaly: Mineral occurrence
Summary: In a well approximately 11 miles north of the town of Tangent between the Peace River and Smoky River, sphalerite occurs in drill cuttings as light to dark yellow subequant crystal masses occupying fractures and vugs in the carbonates and breccias near the Exshaw contact (Packard *et al.*, 1989).

Reference(s): Packard *et al.* 1989. The development of porosity in carbonate reservoirs. *In:* G. Bloy, M. Hadley and B.V. Curtis (eds.), Canadian Society of Petroleum Geologists, Continuing Education Short Course Notes, June 8th and 9th, 1989, Calgary, Alberta.

Anomaly No.: **20**
AGS ID: 83O-1 (Olson *et al.*, 1994)
10TM (UTM): 467158E, 6108550N (594616E, 6111880 - Zone 11)
Type of anomaly: Mineral occurrence
Summary: An occurrence of ironstone is located approximately 17.5 km south of the town of Faust and documented as part of the “south of Peace River” iron occurrences (Kidd, 1959). In Sun Faust No. 1 well (Lsd. 9, Sec. 4, Tp. 71, R. 11, W. 5th Mer.), oolitic ironstone was recorded 6.1 m below the top of a sandstone logged as Bad Heart Formation at a depth of 432.8 m (Kidd, 1959).

Reference(s): Kidd, D.J. 1959. Iron occurrences in the Peace River region, Alberta. Research Council of Alberta, Alberta Geological Survey, Preliminary Report 59-03, 38 p.

Anomaly No.: **21**
AGS ID: 83P-3 (Olson *et al.*, 1994)
10TM (UTM): 649093E, 6183541N (398397E, 6184643 - Zone 12)
Type of anomaly: Mineral occurrence
Summary: A Geological Survey of Canada drill hole located about 3.2 km north of the confluence of the Pelican and Athabasca Rivers, intersected a tremendous flow of gas at 249.9 m below surface. Small nodules of "acorn-sized" iron pyrites were blown out of the hole. The hole then passed through a 0.35 m conglomeritic mass of iron-pyrite nodules embedded in oil. At 250.25 m the drill hole intersected hard slate and the hole was shut down (Dawson, 1899).
Reference(s): Dawson, G.M. 1899. Annual Report (New Series), Volume X, 1897, Geological Survey of Canada, Reports A, H, I, J, M, S.

Anomaly No.: **22**
AGS ID: 84B-1 (Olson *et al.*, 1994)
10TM (UTM): 451688E, 6284683N (574050E, 6287574 - Zone 11)
Type of anomaly: Mineral occurrence
Summary: Likely an occurrence of sphalerite observed in drill cuttings from Loon River Well No. 4-23-89-12W5 Dubord, 1987).
Reference(s): Dubord, M. 1987. Carbonate hosted Pb-Zn potential of northeastern Alberta and the application of petroleum data for mineral exploration. Alberta Research Council, Alberta Geological Survey, Open File Report 1987-07, 42 p.

Anomaly No.: **23**
AGS ID: 84C-1 (Olson *et al.*, 1994)
10TM (UTM): 438455E, 6264764N (561398E, 6267269 - Zone 11)
Type of anomaly: Mineral occurrence
Summary: A hole was drilled about 14 km north-northeast of Little Buffalo Lake to test for oil and gas. During initial drilling a junk sub was run to a depth of 1110 m, and when pulled it was found to contain several pieces of native Cu. The pieces, up to 5 x 2.5 x 1.5 cm thick, assayed up to 99.15% Cu with traces of Co, Fe, Ni, Pb and S (Matheson, 1969). A follow-up side wall coring program failed to locate additional Cu.
Reference(s): Matheson, K.A. 1969. Geological report on Lubicon EV 2-21-87-13W5M. Oilfield Consultants Ltd. Alberta Research Council Economic Minerals File Report No. Cu-AF-001(1). Edmonton, Alberta.

Anomaly No.: **24**
AGS ID: 84C-2 (Olson *et al.*, 1994)
10TM (UTM): 338720E, 6262117N (461757E, 6261718 - Zone 11)
Type of anomaly: Mineral occurrence
Summary: Prospecting and reconnaissance geochemical sampling were conducted about 800 m east of the MacKenzie Highway (35), and approximately 5.5 km south-southeast of the hamlet of Dixonville in 1976. Twenty-four holes were drilled from 1.8 to 3.0 m deep using a two-man hand drill. No significant Al

horizons were discovered, but a very clean marl bed up to 1.07 m thick, 800 m long and 400 m wide was discovered. The marl bed is marine in origin and deposits of "rewash" enriched in Fe are present. Assays grading 94% to 96% CaCO₃ were reported; the prospectors concluded that the marl bed was not large enough to be of economic interest (Bevan, 1977).

Reference(s): Bevan, C.C. 1977. 1976-77 exploration report on Permit No. 198. Peace River Industrial Resources Ltd. Alberta Research Council Economic Minerals Report No. ALN-AF-001(1). Peace River, Alberta.

Anomaly No.: **25**

AGS ID: 84C-3 (Olson *et al.*, 1994); Grimshaw (Edwards, 1990)

10TM (UTM): 339340E, 6232219N (463247E, 6231847 - Zone 11)

Type of anomaly: Geochemical anomaly

Summary: As part of a placer gold study a geochemical evaluation was completed on the preglacial Grimshaw sand and gravels. The Wald Brothers pit (formerly KTL) located southeast of the intersection of Provincial Highways 2 and 35 and approximately 4.5 km northeast of Grimshaw returned gold values up to 20 ppb Au. Four of the six samples analysed returned values over 10 ppb Au. 3 colours were reported from two panned samples (Edwards, 1990).

Reference(s): Edwards, W.A.D. 1990. Placer gold occurrences in Alberta. Alberta Research Council, Alberta Geological Survey, Open File Report 1990-09, 14 p.

Anomaly No.: **26**

AGS ID: 84D-1 (Olson *et al.*, 1994)

10TM (UTM): 258019E, 6230959N (381998E, 6228228 - Zone 11)

Type of anomaly: Mineral occurrence

Summary: Likely an occurrence of sphalerite observed in drill cuttings from PCL Dome Oak No. 11-8-83-6W6 (Dubord, 1987).

Reference(s): Dubord, M. 1987. Carbonate hosted Pb-Zn potential of northeastern Alberta and the application of petroleum data for mineral exploration. Alberta Research Council, Alberta Geological Survey, Open File Report 1987-07, 42 p.

Anomaly No.: **27**

AGS ID: 84D-2 (Olson *et al.*, 1994)

10TM (UTM): 196852E, 6269318N (319756E, 6264783 - Zone 11)

Type of anomaly: Mineral occurrence

Summary: An occurrence of silver in core was reported approximately 3.7 km east of the Alberta - British Columbia border and 17.5 km north-northeast of Boundary Lake. The silver was intersected in Pan-Am 10E A-3 Willow 11-35 well and hosted in interbedded dark gray, silty shale and brownish-grey, silty fine- to medium-grained sandstone of the Gething Formation between a depth of 1182.6 m and 1194.8 m (Baykal, 1968). The mineralization is associated with a NE-striking, steeply NW-dipping fault and with the sandstone and siltstone horizons. Pyrite is also present. An exploration program was recommended but not conducted. Two samples from the drill

core both assayed less than 1.03 g/t Ag. The Boundary Lake Fault is a normal fault with a throw of about 10 to 30 m. It is believed to cut basement rocks and "native Ag" and pyrite mineralization are associated with the fault. A second fault, the Worsley Fault, cuts across the Boundary Lake Fault at its north end.

Reference(s): Baykal, O. 1968. Geological report on Boundary Lake silver prospect, Alberta. Prepared for McGregor Telephone and Power Construction Co. Alberta Research Council Economic Minerals File Report No. AG-AF-001(1).

Anomaly No.: **28**

AGS ID: 84D-3 (Olson *et al.*, 1994)

10TM (UTM): 256218E, 6277393N (378848E, 6274583 - Zone 11)

Type of anomaly: Mineral deposit

Summary: The Worsley Ironstone Deposit is located approximately 10 km north of Worsley. Oolitic sandstone occurs within interbedded hard sideritic ironstone and greenish-grey mudstone of the Smoky Group's Badheart Formation. The size of the deposit is 16 km long by 1 km wide and 2.5 m deep. The oolitic sandstone contains mainly goethite with siderite, pyrite and glauconite. The average grade of the Fe is estimated at 32% - 35%. One hundred twenty drill holes outlined the proven and probable iron reserves in the oolitic sandstone at 25 750 000 tons and 8 225 000 tons respectively (Bertram and Mellon, 1975). More recent exploration programs indicate the Worsley Ironstone Deposit is enriched in Au, with samples assaying from about 3.0 g/t to 25.03 g/t Au (Boulay, 1995, 1996). However, a recent study concluded that apart from some erratic and inconsistent values, most assays (125 out of 151) are in the range of 1 to 5 ppm Au (Olson *et al.*, in press).

Reference(s): Bertram, E.F. and Mellon, G.B. 1975. Peace River Iron Deposits. Alberta Research Council, Alberta Geological Survey, Information Series No. 75, 53 p.

Boulay, R.A. 1995. Report on the Ironcap Gold Property, Peace River area, Alberta. Metallic and Industrial Minerals Permits No. 9390100001 to 9390100008. Alberta Geological Survey Economic Minerals File Report No. 19950002.

Boulay, R.A. 1996. Assessment work, Metallic and Industrial Minerals Permits No. 9390100001 to 9390100008. Alberta Geological Survey Economic Minerals File Report No. 19970010.

Anomaly No.: **29**

AGS ID: 84D-4 (Olson *et al.*, 1994)

10TM (UTM): 275242E, 6307964N (396969E, 6305693 - Zone 11)

Type of anomaly: Mineral deposit

Summary: The Swift Creek North Deposit is located along Rambling Creek approximately 16 km southwest of the confluence with the Notikewan River. Oolitic sandstone occurs within interbedded hard sideritic ironstone and greenish-grey mudstone of the Smoky Group's Badheart Formation. The size

of the deposit is 10 km long by 2 km wide and 7 m deep. The oolitic sandstone contains mainly goethite with siderite, pyrite and glauconite. The average grade of the Fe is estimated at 34%. Hamilton (1974), broadly divided the Bad Heart at Rambling River into three intervals: (1) a 0.75 m top section that comprises reddish-brown, oxidized, oolitic iron-rich sandstone; (2) a 2.5 m thick middle section, where oolitic iron-rich sandstone becomes distinctly dark green in colour and increasingly more massive; and (3) a 5.0 m thick bottom interval, in which the oolite content declines gradually towards the base of the Bad Heart. One hundred fifteen drill holes have outlined proven iron reserves in the oolitic sandstone at 201 000 000 tons (Bertram and Mellon, 1975). A recent trace element study from Hamilton's 1974 samples yielded V concentrations of up to 0.22% V₂O₅, signifying the potential for possible co-products (Olson *et al.*, 1999).

Reference(s): Bertram, E.F. and Mellon, G.B. 1975. Peace River Iron Deposits. Alberta Research Council, Alberta Geological Survey, Information Series No. 75, 53 p.
Hamilton, W.N. 1974. Summary Report: Clear Hills iron sampling program. Alberta Research Council, Alberta Geological Survey, Open File Report 1974-27, 19 p.
Olson, R.A., Eccles, D.R. and Collom, C.J. 1999 [in press]. A study of potential co-product trace elements within the Clear Hills iron deposits, northwestern Alberta. Alberta Energy and Utilities Board, Alberta Geological Survey, Earth Science Report No. 1, ESR 20-01.

Anomaly No.: **30**
AGS ID: 84D-5 (Olson *et al.*, 1994)
10TM (UTM): 280740E, 6297248N (402777E, 6295143 - Zone 11)
Type of anomaly: Mineral deposit
Summary: The Swift Creek South Deposit is located approximately 60 km west-southwest of Manning and approximately 5 km north of the White Mud River. Oolitic sandstone occurs within interbedded hard sideritic ironstone and greenish-grey mudstone of the Smoky Group's Badheart Formation. The size of the deposit is 12 km long by 3 km wide and 5.5 m deep. The oolitic sandstone contains mainly goethite with siderite, pyrite and glauconite. Eight drill holes outlined probable iron reserves at 684 000 000 tons (Bertram and Mellon, 1975).

Reference(s): Bertram, E.F. and Mellon, G.B. 1975. Peace River Iron Deposits. Alberta Research Council, Alberta Geological Survey, Information Series No. 75, 53 p.

Anomaly No.: **31**
AGS ID: 84D-6 (Olson *et al.*, 1994)
10TM (UTM): 286854E, 6280785N (409369E, 6278867 - Zone 11)
Type of anomaly: Mineral deposit
Summary: The White Mud River Deposit is located along the South Whitemud River, approximately 7 km west of the confluence with the Whitemud River. Oolitic

sandstone occurs within interbedded hard sideritic ironstone and greenish-grey mudstone of the Smoky Group's Badheart Formation. The size of the deposit is 8 km long by 3 km wide and 3 m deep. The oolitic sandstone contains mainly goethite with siderite, pyrite and glauconite. Two drill holes outlined probable iron reserves at 205 000 000 tons (Bertram and Mellon, 1975).

Reference(s): Bertram, E.F. and Mellon, G.B. 1975. Peace River Iron Deposits. Alberta Research Council, Alberta Geological Survey, Information Series No. 75, 53 p.

Anomaly No.: **32**

AGS ID: 84D-7 (Olson *et al.*, 1994)

10TM (UTM): 273901E, 6266924N (396826E, 6264635 - Zone 11)

Type of anomaly: Mineral occurrence

Summary: Friable, red-weathering ferriferous sandstones were traced in more than 15 outcrops along the southern slopes of the Clear Hills for approximately 60 km at elevations between 795 and 830 m. There may be several lenses, or erosional gaps between exposures. The oolitic sandstone has an average thickness of 2 m and reach thicknesses of 9 m (Kidd, 1959). This exposure is located approximately 21.5 km east of Worsley. Two grab samples were analysed and yielded 38.10 and 20.90 weight per cent (wt%) Fe.

Reference(s): Kidd, D.J. 1959. Iron occurrences in the Peace River region, Alberta. Research Council of Alberta, Alberta Geological Survey, Preliminary Report 59-03, 38 p.

Anomaly No.: **33**

AGS ID: 84D-8 (Olson *et al.*, 1994)

10TM (UTM): 284011E, 6260363N (407123E, 6258372 - Zone 11)

Type of anomaly: Mineral occurrence

Summary: Friable, red-weathering ferriferous sandstones were traced in more than 15 outcrops along the southern slopes of the Clear Hills for approximately 60 km at elevations between 795 and 830 m. There may be several lenses, or erosional gaps between exposures. The oolitic sandstone has an average thickness of 2 m and reach thicknesses of 9 m (Kidd, 1959). This exposure is located approximately 38.5 km east-southeast of Worsley. One grab sample was analysed and yielded 18.49 wt% Fe.

Reference(s): Kidd, D.J. 1959. Iron occurrences in the Peace River region, Alberta. Research Council of Alberta, Alberta Geological Survey, Preliminary Report 59-03, 38 p.

Anomaly No.: **34**

AGS ID: 84D-9 (Olson *et al.*, 1994)

10TM (UTM): 300364E, 6259247N (423500E, 6257732 - Zone 11)

Type of anomaly: Mineral occurrence

Summary: Friable, red-weathering ferriferous sandstones were traced in more than 15 outcrops along the southern slopes of the Clear Hills for approximately 60

km at elevations between 795 and 830 m. There may be several lenses, or erosional gaps between exposures. The oolitic sandstone has an average thickness of 2 m and may reach thicknesses of up to 9 m (Kidd, 1959). This exposure is located approximately 52 km east-southeast of Worsley.

Reference(s): Kidd, D.J. 1959. Iron occurrences in the Peace River region, Alberta. Research Council of Alberta, Alberta Geological Survey, Preliminary Report 59-03, 38 p.

Anomaly No.: **35**

AGS ID: 84D-10 (Olson *et al.*, 1994)

10TM (UTM): 262264E, 6212677N (386771E, 6210079 - Zone 11)

Type of anomaly: Mineral occurrence

Summary: Reddish-brown oolitic sandstones were observed on the banks of the Peace River near the Dunvegan Ferry on Highway 2. The oolitic sandstone located near the top of the Dunvegan Formation varies in thickness from 0.3 to 3.0 m and outcrops discontinuously for approximately 24 km (Kidd, 1959).

Reference(s): Kidd, D.J. 1959. Iron occurrences in the Peace River region, Alberta. Research Council of Alberta, Alberta Geological Survey, Preliminary Report 59-03, 38 p.

Anomaly No.: **36**

AGS ID: 84E-1 (Olson *et al.*, 1994)

10TM (UTM): 260787E, 6323179N (382076E, 6320477 - Zone 11)

Type of anomaly: Mineral occurrence

Summary: The location of the Bog Iron occurrences have been documented by Kidd (1959). This exposure is located on the Bog Creek approximately 80 km west of Manning.

Reference(s): Kidd, D.J. 1959. Iron occurrences in the Peace River region, Alberta. Research Council of Alberta, Alberta Geological Survey, Preliminary Report 59-03, 38 p.

Anomaly No.: **37**

AGS ID: 84E-2 (Olson *et al.*, 1994)

10TM (UTM): 281542E, 6355090N (401884E, 6352980 - Zone 11)

Type of anomaly: Mineral occurrence

Summary: The location of the Bog Iron occurrences have been documented by Kidd (1959). This exposure is located on the Hotchkiss River approximately 53.5 km northwest of Manning.

Reference(s): Kidd, D.J. 1959. Iron occurrences in the Peace River region, Alberta. Research Council of Alberta, Alberta Geological Survey, Preliminary Report 59-03 , 38 p.

Anomaly No.: **38**

AGS ID: 84E-3 (Olson *et al.*, 1994); Halverson Ridge (Edwards, 1990)

10TM (UTM): 271393E, 6359588N (391608E, 6357177 - Zone 11)

Type of anomaly: Geochemical anomaly

Summary: As part of a placer gold study a geochemical evaluation was completed on the preglacial Halverson Ridge sand and gravels. The AT&U pit located approximately 86 km northwest of Manning, yielded gold values of 5 and 10 ppb Au (Scafe *et al.*, 1988). One possible colour was reported from two panned samples (Edwards, 1990).

Reference(s): Edwards, W.A.D. 1990. Placer gold occurrences in Alberta. Alberta Research Council, Alberta Geological Survey, Open File Report 1990-9, 14 p.
Scafe D.W., Edwards W.A.D and Boisvert D.R. 1988. Sand and gravel resources of the Chinchaga River map area, NTS 84E. Alberta Research Council Open File Report 1988-15, 28 p.

Anomaly No.: **39**

AGS ID: 84G-1 (Olson *et al.*, 1994)

10TM (UTM): 470475E, 6391433N (589705E, 6394880N - Zone 11)

Type of anomaly: Mineral occurrence

Summary: Wadlin Lake area sulphide occurrence. A concentration of small sulphide nodules was discovered in the bed of a small stream approximately 2.5 km southeast of Wadlin Lake. Hennessey *et al.* (1968), reported that a concentration of pyrite (possibly a few hundred pounds of pyrite) could be hand-picked from the stream bottom and postulated that a combination of slumping and erosion of the Cretaceous bedrock [Dunvegan Formation] had carried shale [sandstone] pebbles and pyrite nodules to the bed of the stream whereby washing and stream currents concentrated a spectacular collection of pyrite nodules with little economic value.

Reference(s): Hennessey, W.J., Pearce, L.A. and Wilson, G.A. 1968. Sulphur Permit 12, L.A. Pearce, Geological Evaluation Report. Alberta Research Council Economic Minerals File Report No. S-AF-012(1).

Anomaly No.: **40**

AGS ID: 84J-1 (Olson *et al.*, 1994)

10TM (UTM): 457933E, 6504292N (573813E, 6507369 - Zone 11)

Type of anomaly: Geochemical anomaly

Summary: A prospecting program on the southern slopes of the Caribou Mountains was initiated after a prospector reported Cu-bearing rock specimens. Preliminary investigation showed that the prospector could not relocate the sample sites. 181 stream sediment samples were collected, showing a very uniform Cu distribution with a mean of about 12 ppm Cu. A series of high background readings ranging from 16 to 28 ppm Cu occur in stream sediment samples along a tributary of Beaver Ranch Creek (Swinden and Horsley, 1971). The Cu mineralization is believed to have come from boulders of Precambrian Shield rock in glacial debris.

Reference(s): Swinden, H.S. and Horsley, T.L. 1971. Summary report on Quartz Mineral Exploration Permits 163 to 168, inclusive. Conwest Exploration Company Ltd. Alberta Research Council Economic Minerals File Reports Nos. CU-AF-029 (1), CU-AF-031(1), CU-AF-032(1), CU-AF-033(1) and CU-AF-034(1). Toronto, Ontario.

Anomaly No.: **41**
AGS ID: 84L-1 (Olson *et al.*, 1994)
10TM (UTM): 250204E, 6489545N (366584E, 6486434 - Zone 11)
Type of anomaly: Mineral occurrence
Summary: Banff Aquitaine Well No. 7-32-109-8W6, approximately 6 km east of Rainbow Lake, intersected sphalerite in limestone with gypsum and anhydrite of the Devonian Muskeg Formation (Dubord, 1987; Hriskevick, 1966).
Reference(s): Dubord, M. 1987. Carbonate hosted Pb-Zn potential of northeastern Alberta and the application of petroleum data for mineral exploration. Alberta Research Council, Alberta Geological Survey, Open File Report 1987-07, 42 p.
Hriskevick, M.E. 1966. Stratigraphy of Middle Devonian and older rocks of the Banff Aquitaine Rainbow West 7-32 Discovery Well, Alberta. Bulletin of Canadian Petroleum Geology, v. 14, No. 2, pp. 241-265.

Anomaly No.: **42**
AGS ID: 84L-2 (Olson *et al.*, 1994)
10TM (UTM): 252316E, 6530977N (367459E, 6527905 - Zone 11)
Type of anomaly: Mineral occurrence
Summary: B.A. Zang Lake Well No. 9-5-114-8W6, approximately 8 km north of the north end of the Zana Lake Indian Reservation, intersected sphalerite in dolomite of the Devonian Keg River Formation (Dubord, 1987). Turner and McPhee (1994) resampled cuttings from Chevron's well and reported sample No. 94-01-20-10 yielded 1435 ppm Zn and 4.0 ppm Cd.
Reference(s): Dubord, M. 1987. Carbonate hosted Pb-Zn potential of northeastern Alberta and the application of petroleum data for mineral exploration. Alberta Research Council, Alberta Geological Survey, Open File Report 1987-07, 42 p.
Turner, A. And McPhee, D. 1994. Analyses of Paleozoic core data for the evaluation of potential Pb-Zn mineralization in northeastern Alberta. Alberta Energy, Alberta Geological Survey, Open File Report 1994-18, 51 p.

Anomaly No.: **43**
AGS ID: 84L-3 (Olson *et al.*, 1994)
10TM (UTM): 263114E, 6528096N (378337E, 6525348 - Zone 11)
Type of anomaly: Mineral occurrence
Summary: B.A. Zang Lake Well No. 6-33-113-7W6, approximately 11 km northeast of the north end of the Zana Lake Indian Reservation, intersected sphalerite in dolomite of the Devonian Keg River Formation (Dubord, 1987)
Reference(s): Dubord, M. 1987. Carbonate hosted Pb-Zn potential of northeastern Alberta and the application of petroleum data for mineral exploration. Alberta Research Council, Alberta Geological Survey, Open File Report 1987-07, 42 p.

Anomaly No.: **44**
AGS ID: 84L-4 (Olson *et al.*, 1994)
10TM (UTM): 238395E, 6468398N (355412E, 6464949 - Zone 11)
Type of anomaly: Mineral occurrence
Summary: IOE Rainbow Well No. 13-20-107-9W6, approximately 19.5 km south-southwest of the town of Rainbow Lake, intersected sphalerite in dolomite of the Devonian Keg River Formation (Dubord, 1987)
Reference(s): Dubord, M. 1987. Carbonate hosted Pb-Zn potential of northeastern Alberta and the application of petroleum data for mineral exploration. Alberta Research Council, Alberta Geological Survey, Open File Report 1987-07, 42 p.

Anomaly No.: **45**
AGS ID: 84N-1 (Olson *et al.*, 1994)
10TM (UTM): 358808E, 6572179N (472671E, 6572279 - Zone 11)
Type of anomaly: Mineral occurrence
Summary: Chevron Lutose Well No. 16-34-118-21W5, approximately 9 km north-northeast of Slavey Creek railroad siding (along the MacKenzie Highway), intersected sphalerite in dolomite of the Devonian Keg River Formation (Dubord, 1987). Turner and McPhee (1994) resampled cuttings from Chevron's well and reported the following results:

Sample No.	Pb ppm	Zn ppm	Cd
94-01-20-01	1064	1122	2.8
94-01-20-02	/	15,601	36.5
94-01-20-03	675	37,633	64.8
94-01-20-03	246	99,999	/
94-01-20-05	732	1246	3.2

Reference(s): Dubord, M. 1987. Carbonate hosted Pb-Zn potential of northeastern Alberta and the application of petroleum data for mineral exploration. Alberta Research Council, Alberta Geological Survey, Open File Report 1987-07, 42 p.
 Turner, A. and McPhee, D. 1994. Analyses of Paleozoic core data for the evaluation of potential Pb-Zn mineralization in northeastern Alberta. Alberta Energy, Alberta Geological Survey, Open File Report 1994-18, 51 p.

Anomaly No.: **46**
AGS ID: 84N-2 (Olson *et al.*, 1994)
10TM (UTM): 344848E, 6602568N (457801E, 6602239 - Zone 11)
Type of anomaly: Geological anomaly
Summary: Well IOE No. 12-19-121-21W5, located approximately 27.5 km southwest of the hamlet of Steen River, intersected an area of elevated Precambrian basement rocks (brecciated amphibolite granite with gossan) about 1,100 m above where it was expected (Carrigy, 1968). The Steen River structure and associated volcanic rocks are located near the junction of the NE-trending Great Slave Lake Shear Zone (GSLSZ) and a NW-trending structure that divides the Hottah and the Great Bear Magmatic basement terranes. The

Steen River structure has been interpreted as a meteorite impact feature based on evidence from one drill hole intersection and available seismic data (Winzer, 1972). However, it seems remarkably coincidental that this feature is spatially associated with two major structures, and has been dated about 95 Ma (Carrigy, 1968), which is equivalent to the emplacement age of “neighbouring” volcanic rocks including kimberlite pipes in the Fort à la Corne area (Scott-Smith *et al.*, 1994). In 1997, a lithogeochemistry study of existing core reported that there seems to be 2 igneous intrusive and 2 volcanic rock types, and the depletion of Au and the low amounts of Cu, Ni and Zn mean there is a possibility of ore if one assumes that the rocks tested are the source rocks and have been depleted by some ore forming event (McCleary, 1997).

Reference(s): Carrigy, M.A. 1968. Evidence of shock metamorphism in rocks from the Steen River Structure, Alberta. *In*: B.M. French and N.M. Short (eds.) Shock Metamorphism of Natural Materials, Mono Book Corp., Baltimore, Maryland, pp. 367-378.
McCleary, J. 1997. Metallic and Industrial Mineral Assessment Report on the Steen River Impact Crater. Alberta Geological Survey Economic Minerals File Report 19970004.
Scott-Smith, B. H., Orr, R. G., Robertshaw, P. and Avery, R. W. 1994. Geology of the Fort à la Corne kimberlites, Saskatchewan. CIMM Meeting, October, 1994, pp. 19-24.
Winzer, S.R. 1972. The Steen River astrobleme, Alberta, Canada. 24th International Geological Congress, Section 15, pp. 148-156.

Anomaly No.: 47
AGS ID: 84N-3 (Olson *et al.*, 1994)
10TM (UTM): 376972E, 6599279N (490015E, 6599918 - Zone 11)
Type of anomaly: Mineral occurrence
Summary: Gulfman Anita 7-27-121-19W5 (004) was drilled to a depth of 140.21 m along the east side of the MacKenzie Highway (35), approximately 10.5 km south of the hamlet of Steen River to test for Cu, Pb and Zn mineralization in Devonian carbonate rocks. Assays from Devonian carbonate rocks include 42 ppm Zn, 46 ppm Pb and 19 ppm Cu. Assays from Cretaceous Fort St. John Group bentonitic mudstones yielded 110 ppm Zn, 500 ppm Ba, 210 ppm Mn, 72,500 ppm Fe, 24 ppm Ni and 25 ppm Cu (Germundson and Fischer, 1978).
Reference(s): Germundson, R.K. and Fischer, P.A. 1978. Steen River diamond drill program, Alberta, NTS 84N. Gulf Minerals Canada Ltd. Alberta Research Council Economic Minerals File Report Nos. PB-AG-011(1), PB-AG-012(1), PB-AG-013(1) and PB-AG-014(1). Toronto, Ontario.

Anomaly No.: 48
AGS ID: 84N-4 (Olson *et al.*, 1994)
10TM (UTM): 376526E, 6592537N (489771E, 6593164 - Zone 11)
Type of anomaly: Mineral occurrence
Summary: Gulfman Anita 3-3-121-19W5 (003) was drilled to a depth of 220.07 m along

the east side of the MacKenzie Highway (35), approximately 17.5 km south of the hamlet of Steen River to test for Cu, Pb and Zn mineralization in Devonian carbonate rocks. Assays from Devonian carbonate rocks include 39 ppm Zn, 70 ppm Pb (across 3.05 m), and 40 ppm Cu. Assays from Cretaceous Fort St. John Group bentonitic mudstones yielded 770 ppm Zn, 500 ppm Ba, 390 ppm Mn, 83,500 ppm Fe, 14 ppm Cd, 150 ppm Ni and 190 ppm Cu (Germundson and Fischer, 1978). The core contains stylonitic, fossiliferous, grey-brown limestone with minor green-grey shaly interbeds. Sulphide (pyrite) is found to replace fossils throughout the limestone. Galena (up to 1 cm) is present at 117.85 m, and possible sphalerite crystals at 180.9 m.

Reference(s): Germundson, R.K. and Fischer, P.A. 1978. Steen River diamond drill program, Alberta, NTS 84N. Gulf Minerals Canada Ltd. Alberta Research Council Economic Minerals File Report Nos. PB-AG-011(1), PB-AG-012(1), PB-AG-013(1) and PB-AG-014(1). Toronto, Ontario.

Anomaly No.: **49**

AGS ID: 84N-5 (Olson *et al.*, 1994)

10TM (UTM): 365015E, 6572275N (478873E, 6572562 - Zone 11)

Type of anomaly: Mineral occurrence

Summary: Gulfman Anita 10-32-118-20W5 (002) was drilled to a depth of 140.21 m along the east side of the MacKenzie Highway (35), approximately 40 km south-southwest of the hamlet of Steen River to test for Cu, Pb and Zn mineralization in Devonian carbonate rocks. Assays from Devonian carbonate rocks include 220 ppm Zn, 57 ppm Pb and 29 ppm Cu. Assays from Cretaceous Fort St. John Group bentonitic mudstones yielded 820 ppm Zn, 400 ppm Ba, 280 ppm Mn, 31,400 ppm Fe, 14 ppm Cd, 150 ppm Ni and 170 ppm Cu (Germundson and Fischer, 1978).

Reference(s): Germundson, R.K. and Fischer, P.A. 1978. Steen River diamond drill program, Alberta, NTS 84N. Gulf Minerals Canada Ltd. Alberta Research Council Economic Minerals File Report Nos. PB-AG-011(1), PB-AG-012(1), PB-AG-013(1) and PB-AG-014(1). Toronto, Ontario.

Anomaly No.: **50**

AGS ID: 84N-6 (Olson *et al.*, 1994)

10TM (UTM): 357143E, 6564266N (471243E, 6564319 - Zone 11)

Type of anomaly: Mineral occurrence

Summary: Gulfman Anita 1-4-118-21W5 (001) was drilled along the east side of the MacKenzie Highway (35), approximately 50 km south-southwest of the hamlet of Steen River to test for Cu, Pb and Zn mineralization in Devonian carbonate rocks. Assays from Devonian carbonate rocks yielded 740 ppm Zn, 310 ppm Cu and 140 ppm Ni (Germundson and Fischer, 1978).

Reference(s): Germundson, R.K. and Fischer, P.A. 1978. Steen River diamond drill program, Alberta, NTS 84N. Gulf Minerals Canada Ltd. Alberta Research Council Economic Minerals File Report Nos. PB-AG-011(1), PB-AG-012(1), PB-AG-013(1) and PB-AG-014(1). Toronto, Ontario.

Anomaly No.: **51**
AGS ID: 93-12-20-05 and 93-12-20-06 (Turner and McPhee, 1994)
10TM (UTM): 326030E, 6590138N (439364E, 6589248N - Zone 11)
Type of anomaly: Mineral occurrence
Summary: Turner and McPhee (1994) resampled core from Can Seab'd Hay River Well No. 10-22-120-1W6. Sample No. 93-12-20-05 was collected at a depth of 1233.46 m from a fractured section of the Slave Point Formation (possibly) with trace sphalerite and assayed 4704 ppm Zn. Sample No. 93-12-20-06, collected at a depth of 1236.54 m from a fractured section of the Slave Point Formation containing trace galena, assayed 5187 ppm Pb.
Reference(s): Turner, A. and McPhee, D. 1994. Analyses of Paleozoic core data for the evaluation of potential Pb-Zn mineralization in northeastern Alberta. Alberta Energy, Alberta Geological Survey, Open File Report 1994-18, 51 p.

Anomaly No.: **52**
AGS ID: 93-10-28-19 (Turner and McPhee, 1994)
10TM (UTM): 720673E, 6290595N (476072E, 6287365N - Zone 12)
Type of anomaly: Mineral occurrence
Summary: Core cuttings from Bear Rodeo No.1 well (8-20-89-9W4) was resampled by Turner and McPhee (1994). Sample No. 93-10-27-14 assayed 2816 ppm Zn and 8.7 ppm Cd from a possible section altered Prairie Evaporite Formation at a depth of 226.47 m. Sample No. 93-10-28-19, of possible Ernest Lake Formation, assayed 328 ppm Cu and 37 ppm Au at a depth of 336.19 m.
Reference(s): Turner, A. and McPhee, D. 1994. Analyses of Paleozoic core data for the evaluation of potential Pb-Zn mineralization in northeastern Alberta. Alberta Energy, Alberta Geological Survey, Open File Report 1994-18, 51 p.

Anomaly No.: **53**
AGS ID: 93-10-21-19 (Turner and McPhee, 1994)
10TM (UTM): 706717E, 6331645N (464542E, 6329155N - Zone 12)
Type of anomaly: Mineral occurrence
Summary: Sample No. 93-10-21-19 from Bear Vampire No. 2 (4-32-93-10W4) assayed 57 ppb Au at a depth of 194.16 m in the Keg River Formation (Turner and McPhee, 1994).
Reference(s): Turner, A. and McPhee, D. 1994. Analyses of Paleozoic core data for the evaluation of potential Pb-Zn mineralization in northeastern Alberta. Alberta Energy, Alberta Geological Survey, Open File Report 1994-18, 51 p.

Anomaly No.: **54**
AGS ID: 93-11-02-08 (Turner and McPhee, 1994)
10TM (UTM): 713003E, 6111907N (458087E, 6109449N - Zone 12)
Type of anomaly: Mineral occurrence
Summary: Turner and McPhee (1994) resampled core from PAM AM ARCO A-1 PHILOM Well No. 7-8-71-11W4. Sample No. 93-11-02-08 intersected trace pyrite and sphalerite in the Beaverhill Lake Formation (Moberly Member)

and reported a 1690 ppm Zn at a depth of 588.80 m.
Reference(s): Turner, A. and McPhee, D. 1994. Analyses of Paleozoic core data for the evaluation of potential Pb-Zn mineralization in northeastern Alberta. Alberta Energy, Alberta Geological Survey, Open File Report 1994-18, 51 p.

Anomaly No.: **55**
AGS ID: 93-11-09-04 (Turner and McPhee, 1994)
10TM (UTM): 575472E, 6165693N (323834E, 6171064N - Zone 12)
Type of anomaly: Mineral occurrence
Summary: IMP Pelican Hills Well No. 6-10-77-25W4 assayed 1620 ppm Zn from core cuttings collected at a depth of 1055.61 m in the possible Woodbend Formation (Turner and McPhee, 1994).

Reference(s): Turner, A. and McPhee, D. 1994. Analyses of Paleozoic core data for the evaluation of potential Pb-Zn mineralization in northeastern Alberta. Alberta Energy, Alberta Geological Survey, Open File Report 1994-18, 51 p.

Anomaly No.: **56**
AGS ID: Firebag River drilling anomaly (Dufresne *et al.*, 1994)
10TM (UTM): 750620E, 6380320N (511219E, 6375156N - Zone 12)
Type of anomaly: Mineral occurrence
Summary: Dufresne *et al.* (1994) resampled core cuttings from five Shell Canada Ltd. drill holes that were drilled during a coal exploration program in the Firebag area during the mid 1970's. Results from 23 core samples yielded up to 837 ppb Au, 211 ppm Zn, 85 ppm Ni, 553 Cr, 14 ppm As, 21 ppm Co, 61 ppm Cu, 97 ppm Pb, 951 Sr, 4 ppm Sb, 6 ppm Bi, 1.1 ppm Ag and 257 ppm Bo. Anomalous concentrations of Au were discovered in all five drill holes, including 8 samples yielding greater than 100 ppb Au and four samples yielding greater than 500 ppb Au. The high Au value (837 ppb Au) was assayed from a sample of oil sands with massive pyrite and quartz nodules.

Reference(s): Dufresne, M.B., Henderson, B.A., Fenton, M.M., Pawlowicz, J.G. and Richardson, R.J.H. 1994. The mineral deposits of the Marguerite River and Fort McKay areas, northeast Alberta. Alberta Energy and Utilities Board, Alberta Geological Survey, Open File Report 1994-09, 67 p.

Anomaly No.: **57**
AGS ID: Focal Resources Ltd. (Bradley Property)
10TM (UTM): 704915E, 6341978N (463350E, 6339575N - Zone 12)
Type of Anomaly: Mineral occurrence
Summary: Drill hole and surface samples collected near Fort MacKay from the Devonian Waterways Formation limestone yielded up to 68.6 g/t Au, 40.8 g/t Pt, and 44.6 g/t Rh from surface samples and 13.7 g/t Au, 78.5 g/t Pt and 18.5 g/t Rh from drill core samples. These results were controversial because they were obtained using "non-traditional" assaying techniques (Northern Miner, 1993a,b). However, standard fire assay techniques did yield values of up to 45.1 g/t Au, 180.3 g/t Ag and 2.5 g/t Pt (Focal Resources Limited, 1993).

Reference(s): Focal Resources Limited, 1993. Various press releases issued by Focal

Resources and provide by the Alberta Stock Exchange. The releases are dated: April 15, 1993; April 21, 1993; May 6, 1993; June 7, 1993; June 28, 1993; and September 15, 1993.

Northern Miner, 1993a. Focal drills Alberta prospect. The Northern Miner Newspaper, April 26 issue, p.3.

Northern Miner, 1993b. ASE requests fire assays of Focal drill samples. The Northern Miner Newspaper, May 3 issue, pp. 1,2.

Anomaly No.: **58**
AGS ID: Beaver River Sandstone
10TM (UTM): 685551E, 6338662N (443825E, 6337400N - Zone 12)
Type of Anomaly: Mineral occurrence
Summary: Surface samples collected by Tintina Mines Ltd. from Devonian Waterways Formation carbonates and the overlying, well-indurated, silicified Beaver River sandstone yielded concentrations of up to 19.38 g/t Au and 18.97 g/t Ag (Franklin, 1993). In 1993, drill holes T2, T3 and T4 yielded up to 10.0 g/t Au across 0.8 m, 11.0 g/t Au across 1.5 m and 8.1 g/t Au across 1.7 m respectively (Franklin, 1994). Two drill holes intersected disseminated sulphides, sulphide pods, spheroids and sulphide-healed fractures in collapse breccia zones.
Reference(s): Franklin, C.H. 1993. Unpublished press release by Tintina Mines Limited and NSR Resources Inc., October 27, 1993.
Franklin, C.H. 1994. Unpublished press release by Tintina Mines Limited and NSR Resources Inc., February 10, 1994.

Anomaly No.: **59**
AGS ID: Caribou Mountains - North Slope Buffalo River
10TM (UTM): 526011E, 6577677N (639700E, 6582800N - Zone 11)
Type of anomaly: Geochemical anomaly
Summary: In 1995, a stream sediment sample collected along the Buffalo River for Birch Mountain Resources Ltd. assayed 539 ppb Au, 127 ppm Zn and 168 ppb Hg (Besserer and Dufresne, 1995).
Reference(s): Besserer, D.J. and Dufresne, M.B. 1995. Birch Mountain Minerals Ltd., exploration for gold - 1994 Fort Vermilion Region, northeast Alberta. March, 1995. Alberta Geological Survey Economic Minerals File Report 19960002, Appendix B3.

Anomaly No.: **60**
AGS ID: Caribou Mountains - South Slope Fitz Creek
10TM (UTM): 554025E, 6501555N (670000E, 6507500N - Zone 11)
Type of anomaly: Geochemical anomaly
Summary: In 1995, a stream sediment sample collected along Fitz Creek for Birch Mountain Resources Ltd. assayed 217 ppm Zn, 30 ppm Cu, 21 ppm Pb, 178 ppb Hg and 2.3 ppm Cd (Besserer and Dufresne, 1995)
Reference(s): Besserer, D.J. and Dufresne, M.B. 1995. Birch Mountain Minerals Ltd., exploration for gold - 1994 Fort Vermilion Region, northeast Alberta. March,

1995. Alberta Geological Survey Economic Minerals File Report 19960002, Appendix B3.

Anomaly No.: **61**
AGS ID: Harper/Lambert Creek
10TM (UTM): 539590E, 6446499N and 539881E, 6446191N
(657200E, 6452000N and 657500E, 6451700N - Zone 11)
Type of anomaly: Mineral occurrence
Summary: In 1996, Birch Mountain Resources Ltd. reported that a bedrock grab sample of pyritic, fossiliferous Devonian carbonate yielded 45 ppm Pb and 198 ppm Zn. To the southwest a stream sediment sample collected along the confluence of Harper and Lambert Creeks assayed 32 ppm Cu and 127 ppm Zn (Besserer and Dufresne, 1995)
Reference(s): Besserer, D.J. and Dufresne, M.B. 1995. Birch Mountain Minerals Ltd., exploration for gold - 1994 Fort Vermilion Region, northeast Alberta. March, 1995. Alberta Geological Survey Economic Minerals File Report 19960002, Appendix B3.

Anomaly No.: **62**
AGS ID: Aurora (News Release)
10TM (UTM): 703353E, 6354980E (462554E, 6352645N - Zone 12)
Type of Anomaly: Mineral occurrence
Summary: In 1998, Birch Mountain Resources Ltd. reported that core from drill hole 11-7-AE-9610W4 fire assayed between 2.2 g/t and 4.9 g/t Pt, and 0.2 g/t Au (News release, 1998).
Reference(s): News Release. 1998. Birch Mountain signs information sharing and cooperation agreement with Shell Canada and BHP diamonds. March, 1998.

Anomaly No.: **63**
AGS ID: Ells River
10TM (UTM): 682718E, 6343553N (441285E, 6342450N - Zone 12)
Type of Anomaly: Geochemical Occurrence
Summary: In 1996, thirty-one grains of Au up to 0.22 by 0.3 mm in size were identified in one stream sediment heavy mineral concentrate sample from the Ells River (Cieszynski *et al.*, 1996).
Reference(s): Cieszynski, H., Keylor, M, and Caron & A. Cowen, R. 1996. Assessment Report for Five Metallic and Industrial Minerals Permits (Ells River Area). March, 1996. Alberta Geological Survey Economic Minerals File Report 19960005.

Anomaly No.: **64**
AGS ID: Tar River
10TM (UTM): 679688E, 6364666N (439500E, 6363705N - Zone 12)
Type of Anomaly: Mineral Occurrence
Summary: In 1996, an exposure of the Shaftesbury Formation (Fish Scale Formation) shale along the Tar River was analysed and yielded up to 1.3 ppm Ag, 2.3

ppm Cd, 272 ppm Zn, 120 ppm Cr, 80 ppm V, 34 ppm Sn, 26 ppm As, 33 ppm Te and 26 ppm Bi (Besserer and Dufresne, 1996).

Reference(s): Besserer, D.J. and Dufresne, M.B. 1996. Ells River Resources Inc., Precious-base metal exploration - 1995, Ells River area, northeast Alberta. March, 1996. Alberta Geological Survey Economic Minerals File Report 19960005.

Anomaly No.: **65**

AGS ID: Gos 1 and Gos Creek (Buckton Property)

10TM (UTM): 688662E, 6401472N and 686386E, 6399380N
(450627E, 6399919N and 448231E, 6397965N - Zone 12)

Type of Anomaly: Mineral Occurrence

Summary: In 1993, a lithochemical sampling program at Gos 1 yielded an enrichment in metallic minerals (Ni/Cu/Zn/V/Co/Ag+Au+Pt+Pd) from the sulfide-bearing Second White Specks Formation carbonaceous shales. Concentrations were highest near the base of the formation, which is characterized by a siliciclastic bone bed marine extinction marker (Sabag, 1996). The Gos Creek occurrence is characterized by elevated concentrations (>90th percentile) of Ni+Zn+Hg, with alluvial gold in stream sediment heavy mineral concentrates (Sabag, 1996). In 1996-1997, a detailed soil sampling survey identified a Ni/Cu enrichment zone in soils at the Buckton Property overlying a fault zone (Sabag, 1998). In 1997, six drill holes, located about 4 km north-northwest of the Birch Mountain Tower and Airstrip and approximately 115 km northwest of Fort McMurray, penetrated a poorly calcareous, grey to brownish grey shale with up to 20 bentonite horizons over a 1 to 4 m interval, and 10 to 20% pyrite or marcasite in the upper part of the Second White Specks Formation. Highly anomalous metals include Ba, ranging from 0.5 to 3.1%, Fe, S with erratic but usually anomalous values of As, Ag, Co, Cr, Cd, Ni, Mo, Sb, U, Y, Zn and most of the REE's. Non-pulverized samples from drill holes BK01, BK03 and BK06 yielded between 3.4 and 4.3 g/t Au; one non-pulverized and deflocculated (pretreatment for segregation of metallic and non-metallic clays) sample from BK03 yielded 7.39 g/t Au (News Release, 1999). Table heavies and middlings from a 5 kg composite sample of drill holes BK02, BK04 and BK05 (non-pulverized and deflocculated) yielded up to 27.7 and 30.6 g/t Au respectively.

Reference(s): Sabag, S.F. 1996. Buckton Property, Northeast Alberta - Summary Report Exploration Programs 1993-95 and Work in Progress 1996. Alberta Geological Survey Economic Minerals File Report 19960011.

Sabag, S.F. 1998. Metallic and Industrial Assessment Report on the Asphalt and Buckton Properties in Northeastern Alberta; Birch Mountain area. Alberta Geological Survey Economic Minerals File Report 19980002.

News Release Transmitted by Canadian Corporate News. 1999. Tintina Mines Limited and NSR Resources Inc. February 26, 1999.

Anomaly No.: **66**
AGS ID: Pierre River (Asphalt Property)
10TM (UTM): 682220E, 6375112N (442642E, 6373984N - Zone 12)
Type of Anomaly: Mineral Occurrence
Summary: During 1993 and 1996-1997, numerous stream sediment polymetallic geochemical anomalies dominated by Zn/Ni/Cu were associated with alluvial gold, accompanied by cinnabar and base metal sulfides, in heavy mineral concentrates from Pierre Creek (Sabag, 1996, 1998). Pierre Creek flows southeasterly from an area characterized by lake sediment geochemical Zn anomalies in a small lake, which has been offset along a northeasterly trend. In 1997, two drill holes, located near the Pierre River and approximately 93 km northwest of Fort McMurray, penetrated significant concentrations of sulphide hosted by bentonitic, Second White Specks Formation shale and siliciclastic bone beds at 27.65 to 28.08 m and 30.64 to 31.03 m respectively. Highly anomalous concentrations of Ba and As, and significant concentrations of As, Cd, Ce, Cu, Ni, P, Se, U, Y and Zn were reported in drill hole 7AS02. One non-pulverized sample from drill hole AS02 yielded 11.6 g/t Au; one non-pulverized and deflocculated (pretreatment for segregation of metallic and non-metallic clays) sample yielded 6.70 g/t Au (News Release, 1999).

Reference(s): Sabag, S.F. 1996. Asphalt Property, Northeast Alberta - Summary Report Exploration Programs 1993-95 and Work in Progress 1996. Alberta Geological Survey Economic Minerals File Report 19960013.
Sabag, S.F. 1998. Metallic and Industrial Assessment Report on the Asphalt and Buckton Properties in Northeastern Alberta; Birch Mountain area. Alberta Geological Survey Economic Minerals File Report 19980002.
News Release Transmitted by Canadian Corporate News. 1999. Tintina Mines Limited and NSR Resources Inc. February 26, 1999.

Anomaly No.: **67**
AGS ID: McIvor River
10TM (UTM): 672383E, 6427440N (435910E, 6426805N - Zone 12)
Type of Anomaly: Geochemical Occurrence
Summary: Placer gold was discovered over an area of approximately 10 km in the McIvor River and the KRC tributary located about 140 km to the northwest of Fort McMurray in the Birch Mountains area. While the source to the alluvial gold has not to date been definitively located, native gold grains repeatedly recovered from samples of Second White Specks shales from elsewhere in the Birch Mountains area support a similar source to gold in the McIvor valley. Other minerals of interest to date recovered from reconnaissance work include chromite and a Pd-Ag native metal alloy. While placer testing observed gold in many of the concentrates from eleven trenches, the program was plagued by considerable mechanical difficulties partially attributed to the unsuitability of the Knelson concentrator to collect generally fine, hydrophobic gold (Sabag, 1996). The best results were obtained from sample site 5088 on the McIvor River, which yielded over

1212 Au grains and was amortized to the field pan equivalent of 739 grains/5 kg. Ballantyne and Harris (1994) reported that GSC sampling in the McIvor River area yielded pristine Au-Ag grains containing inclusions and encrustations of mineral gangue, pyrite or Cu-Fe-S.

Reference(s): Ballantyne, S.B. and Harris, D.C., 1994. The exploration significance of Central Alberta Modern and Tertiary Alluvial Platinum Group Minerals, Chromites, Ilmenites and Placer Gold. *In: The Calgary and Mining Forum, Program and Abstracts, 10 & 11 February, 1994; published by the Calgary Mineral Exploration Group.*

Sabag, S.F. 1996. McIvor Property, Northeast Alberta - Summary Report Exploration Programs 1993-1995 and Work in Progress 1996. Alberta Geological Survey Economic Minerals File Report 19960010.

Anomaly No.: **68**

AGS ID: Greystone Creek

10TM (UTM): 672067E, 6435503N (436072E, 6434873N - Zone 12)

Type of Anomaly: Mineral occurrence

Summary: In 1995, six samples were collected from a slumped section of Shaftesbury Formation shales on the banks of Greystone Creek located approximately 145 km northwest of Fort McMurray in the Birch Mountains. Samples 95RE10-005 and -006 assayed up to 2.7 ppm Ag, 9 ppb Au, 228 ppm Ni, 939 ppm V, 761 ppm Zn and elevated concentrations of Cd, Co, Cr, Cu and Mo (Sabag, 1996).

Reference(s): Sabag, S.F. 1996. McIvor Property, Northeast Alberta - Summary Report Exploration Programs 1993-1995 and Work in Progress 1996. Alberta Geological Survey Economic Minerals File Report 19960010.

Anomaly No.: **69**

AGS ID: Avenir Pit

10TM (UTM): 676180E, 6097870N (420522E, 6097542N - Zone 12)

Type of Anomaly: Geochemical Occurrence

Summary: In 1996, sample concentrates from streams, sand hills and gravel pits were examined for a wide variety of minerals in the Wandering River area located approximately 25 km north-northwest of Lac La Biche. Heavy minerals detected include gold (the initial exploration target), platinum, titanium minerals (ilmenite, rutile and leucosene), and zircon. Garnet, kyanite and monzanite are also present. Sediments in the Avenir area yielded the greatest amount of black sand and contained the largest variety of potentially economic minerals. Gold grains, which can be panned out of most samples, occur as extremely fine (200 - 300 microns) flakes, wire and small nuggets (Cieszynski *et al.*, 1996). Gold sample concentrations include 94 grains (panned 6.35 kg sample) from the Avenir Pit and 35 grains (panned 4.4 kg sample) from a nearby cut line.

Reference(s): Cieszynski, H., Keylor, M., Caron R. and Cowen, A. 1996. Metallic and Industrial Mineral Assessment Report on the Wandering River Property. Alberta Geological Survey Economic Minerals File Report 19960022.

Anomaly No.: **70**
AGS ID: MacKay River
10TM (UTM): 659650E, 6297144N (415536E, 6297466N - Zone 12)
Type of Anomaly: Geochemical Occurrence
Summary: In 1995, one 9.3 kg stream sediment sample from the MacKay River yielded 500 total grains of gold and was amortized to field pan equivalent of 269 Au grains/5 kg. (Sabag, 1996). The sample site is located in the Thickwood Hills approximately 66 km west of Fort McMurray.
Reference(s): Sabag, S.F. 1996. Firebag Property, Northeast Alberta - Summary Report Exploration Programs 1993-95. Alberta. Geological Survey Economic Minerals File Report 19960014.

Anomaly No.: **71**
AGS ID: Simmonette River
10TM (UTM): 297368E, 6112463N (424745E, 6110928N - Zone 11)
Type of Anomaly: Geochemical occurrence
Summary: In 1996, one stream sediment heavy mineral concentrate sample (about 15-20 kg panned to 472.47 g) from the Simmonette River yielded 40 Au grains (Eccles *et al.*, 1998). Background for the area is nil to 5 grains of Au. The sample site is located approximately 90 km southeast of Grande Prairie. The average grain size is 114 x 149 microns and the largest grain is 320 x 440 microns. Thirty-four grains yielded an abraded, or placer-type, surface morphology. No delicate, or proximal, surface characteristics were noted.
Reference(s): Eccles, D.R., Dufresne, M.B. and Lywood, P. 1998. Diamond and Metallic mineral potential of the Kakwa/Wapiti area, west-central Alberta. Alberta Energy and Utilities Board, Alberta Geological Survey, Open File Report 1998-02, 77 p.

Anomaly No.: **72**
AGS ID: Suncor
10TM (UTM): 349588E, 6317698N (471000E, 6317600N - Zone 11)
Type of Anomaly: Mineral Deposit
Summary: Titanium and zirconium minerals are concentrated in the tailings streams from the Suncor Inc. Oil Sands Group deposit located directly north of Fort McMurray. A total of 155 samples were analysed: 125 samples from eight core holes targeting Suncor Plant 4 centrifuge tailings; and 30 samples from a geotechnical drilling program on Suncor Pond No. 1. The samples yielded 10.9% to 12.9% TiO₂ and 1.1% to 3.6% Zr. Based on average assays, the total production of titanium and zirconium is 86,000 tonnes/year (t/y)TiO₂ and 25,000 t/y zirconium dioxide from Suncor Plant 4 centrifuge tailings. Suncor Pond 1 total production is calculated to yield 1.2 million tonnes TiO₂ and 360,000 tonnes zirconium oxide (Alberta Chamber of Resources, 1997). Other notable metals include: (1) Au concentrations from Suncor Pond 1 tailings yielded up to 50 ppb Au and averaged 7 ppb Au; (2) Ag assays from a Suncor Lease 97 estuarine sample yielded up to 11 ppm Ag; and (3)

samples from Suncor Pond 1 yielded concentrations of 11 ppb Pt and 45 ppb Pd in the plus 105 micron fraction, and 43 ppb Pt and 11 ppb Pd in the minus 44 micron fraction (Alberta Chamber of Resources, 1997).

Reference(s): Alberta Chamber of Resources. 1997. The future of the oil sands heavy mineral production. Executive Summary, 62 p.

Anomaly No.: 73

AGS ID: Syncrude

10TM (UTM): 341736E, 6322830N (463000E, 6322500N - Zone 11)

Type of Anomaly: Mineral Deposit

Summary: Titanium and zirconium minerals are concentrated in the tailings streams from the Syncrude Canada Ltd. centrifuge plants located directly north of Fort McMurray. A total of 133 samples were analysed from 18 core holes targeting Syncrude Plant 6 centrifuge tailings. The samples yielded 8.5% to 14.0% TiO₂ and 0.4% to 2.7% Zr. Based on average assays, the total production of titanium and zirconium is 207,000 tonnes/year (t/y) titanium and 61,000 t/y zirconium dioxide from Syncrude Plant 6 centrifuge tailings (Alberta Chamber of Resources, 1997). In addition, one core sample from the Sandalta oil sands (Gulf Lease 30) located approximately 40 km north of Fort McMurray yielded 82 ppb Au and 200 ppm W (Gulf Canada Resources Limited, 1993).

Reference(s): Alberta Chamber of Resources. 1997. The future of the oil sands heavy mineral production. Executive Summary, 62 p.

Gulf Canada Resources Limited. 1993. Phase I of a study to assess the potential of co-product minerals and metals in Alberta's oil sand deposits. Alberta Energy and Utilities Board, Alberta Geological Survey, Open File Report 1993-24, 25 p.

7.0 SUMMARY OF OCCURRENCES OF PLACER GOLD

This section summarizes a compilation by Edwards (1990) of the occurrences of placer gold in Recent alluvium north of Latitude 55°N, Alberta. Any placer gold accumulations with concentrations greater than 10 ppb Au, or greater than 50 mg/cu yd Au, have been classified as geochemical anomalies and may be located in Section 6.0; for the area north of Latitude 55°N, Alberta, two occurrences of placer gold were deemed as geochemical anomalies including the preglacial Halverson Ridge and Grimshaw gravels.

Anomaly No.: **P1**
AGS ID: Athabasca River-9 (Edwards, 1990)
10TM (UTM): 560872E, 6111312N (688273E, 6117330N - Zone 11)
Type of Exposure: river bar
Mineral Analysis: gold present (1 cu ft. moss rich)
References: Giusti L. 1983. The distribution, grades and mineralogical composition of gold-bearing placers in Alberta. University of Alberta, M.Sc. thesis, 397 p.
Giusti L. 1986. The morphology, mineralogy, and behavior of “fine-grained” gold from placer deposits of Alberta: sampling and implications for mineral exploration. Can. J. Earth Sci. v. 23, No. 11, pp. 1662-1672.

Anomaly No.: **P2**
AGS ID: Athabasca River-10 (Edwards, 1990)
10TM (UTM): 574809E, 6116733N (320356E, 6122188 - Zone 12)
Type of Exposure: river; island, upstream end
Chemical Analysis: assays: 18-35 mesh = nil mg/cu yd (3.0 cu ft); 35-60 mesh = nil mg/cu yd (3.0 cu ft); 60-120 mesh = 0.630 mg/cu yd (3.0 cu ft); -120 mesh = 0.630 mg/cu yd (3.0 cu ft); *total* = 1.260 mg/cu yd
References: Halferdahl L.B. 1965. The occurrence of gold in Alberta rivers. Alberta Research Council Open File Report 1965-11, 22 p.
Shaw J. and Kellerhals R. 1982. The composition of Recent alluvial gravels in Alberta river beds. Alberta Research Council Bulletin 41, 151 p.

Anomaly No.: **P3**
AGS ID: Athabasca River-12 (Edwards, 1990)
10TM (UTM): 719841E, 6290951N (475263E, 6287769N - Zone 12)
Type of Exposure: river, island bar
Mineral Analysis: some colours (2 cu ft. sand and gravel)
References: Giusti L. 1983. The distribution, grades and mineralogical composition of gold-bearing placers in Alberta. University of Alberta, M.Sc. thesis, 397 p.
Giusti L. 1986. The morphology, mineralogy, and behavior of fine grained gold from placer deposits of Alberta: sampling and implications for mineral exploration. Can. J. Earth Sci. v. 23, No. 11, pp. 1662-1672.

Anomaly No.: **P4**
AGS ID: Hangingstone River-1 (Edwards, 1990)
10TM (UTM): 723254E, 6255873N (476626E, 6252559N - Zone 12)
Type of Exposure: river bank
Mineral Analysis: few colours (1 cu ft. sand, gravel and clay)
References: Giusti L. 1983. The distribution, grades and mineralogical composition of gold bearing placers in Alberta. University of Alberta, M. Sc. thesis, 397 p.

Anomaly No.: **P5**
AGS ID: Little Smoky River-2 (Edwards, 1990)
10TM (UTM): 363859E, 6145789N (490256E, 6146151N - Zone 11)
Type of Exposure: river bank
Mineral Analysis: few very fine grains (2 cu ft. sand)
References: Giusti L. 1983. The distribution, grades and mineralogical composition of gold bearing placers in Alberta. University of Alberta, M. Sc. Thesis, 397 p.

Anomaly No.: **P6**
AGS ID: Peace River-1 (Edwards, 1990)
10TM (UTM): 193165E, 6229929N (317218E, 6225318N - Zone 11)
Type of Exposure: river; bed
Chemical Analysis: assays: 60-120+(-120) mesh = 0.193 mg/cu yd (16.8 cu ft); *total* = 0.193 mg/cu yd
References: Shaw J. and Kellerhals R. 1982. The composition of Recent alluvial gravels in Alberta river beds. Alberta Research Council Bulletin 41, 151 p.
Halferdahl L.B. 1965. The occurrence of gold in Alberta rivers. Alberta Research Council Open File Report 1965-11, 22 p.

Anomaly No.: **P7**
AGS ID: Peace River-2 (Edwards, 1990)
10TM (UTM): 256511E, 6214904N (380957E, 6212139N - Zone 11)
Type of Exposure: river; island near upstream end
Chemical Analysis: assays: 60-120+(-120) mesh = 2.475 mg/cu yd (16.8 cu ft); *total* = 2.475 mg/cu yd
References: Shaw J. and Kellerhals R. 1982. The composition of Recent alluvial gravels in Alberta river beds. Alberta Research Council Bulletin 41, 151 p.
Halferdahl L.B. 1965. The occurrence of gold in Alberta rivers. Alberta Research Council Open File Report 1965-11, 22 p.

Anomaly No.: **P8**
AGS ID: Peace River-3 (Edwards, 1990)
10TM (UTM): 256894E, 6214480N (381352E, 6211726 N - Zone 11)
Type of Exposure: river; island near middle
Chemical Analysis: assays: 35-60 mesh = 0.338 mg/cu yd (20.0 cu ft); 60-120+(-120) mesh = 1.242 mg/cu yd (20.0 cu ft); *total* = 1.680 mg/cu yd
References: Shaw J. and Kellerhals R. 1982. The composition of Recent alluvial gravels in Alberta river beds. Alberta Research Council Bulletin 41, 151

p.
Halferdahl L.B. 1965. The occurrence of gold in Alberta rivers. Alberta Research Council Open File Report 1965-11, 22 p.

Anomaly No.: **P9**
AGS ID: Peace River-5 (Edwards, 1990)
10TM (UTM): 341157E, 6217006N (465505E, 6216693N - Zone 11)
Type of Exposure: river; bed
Chemical Analysis: assays: 60-120+(-120) mesh = 1.323 mg/cu yd (14.9 cu ft); *total* = 1.323 mg/cu yd
References: Shaw J. and Kellerhals R. 1982. The composition of Recent alluvial gravels in Alberta river beds. Alberta Research Council Bulletin 41, 151 p.
Halferdahl L.B. 1965. The occurrence of gold in Alberta rivers. Alberta Research Council Open File Report 1965-11, 22 p.

Anomaly No.: **P10**
AGS ID: Peace River-6 (Edwards, 1990)
10TM (UTM): 341996E, 6217787N (466321E, 6217498N - Zone 11)
Type of Exposure: river; island near upstream end
Chemical Analysis: assays: 35-60 mesh = 0.014 mg/cu yd (20.0 cu ft); 60-120+(-120) mesh = 0.891 mg/cu yd (20.0 cu ft); *total* = 0.905 mg/cu yd
References: Shaw J. and Kellerhals R. 1982. The composition of Recent alluvial gravels in Alberta river beds. Alberta Research Council Bulletin 41, 151 p.
Halferdahl L.B. 1965. The occurrence of gold in Alberta rivers. Alberta Research Council Open File Report 1965-11, 22 p.

Anomaly No.: **P11**
AGS ID: Peace River-9 (Edwards, 1990)
10TM (UTM): 358128E, 6291253N (480311E, 6291412N - Zone 11)
Type of Exposure: river; island near upstream end
Chemical Analysis: assays: 60-120+(-120) mesh = 1.125 mg/cu yd (16.8 cu ft); *total* = 1.125 mg/cu yd
References: Shaw J. and Kellerhals R. 1982. The composition of Recent alluvial gravels in Alberta river beds. Alberta Research Council Bulletin 41, 151 p.
Halferdahl L.B. 1965. The occurrence of gold in Alberta rivers. Alberta Research Council Open File Report 1965-11, 22 p.

Anomaly No.: **P12**
AGS ID: Peace River-10 (Edwards, 1990)
10TM (UTM): 373362E, 6359198N (493550E, 6359786N - Zone 11)
Type of Exposure: river; island near upstream end
Chemical Analysis: assays: 60-120+(-120) mesh = 0.236 mg/cu yd (14.9 cu ft); *total* = 0.236 mg/cu yd
References: Shaw J. and Kellerhals R. 1982. The composition of Recent alluvial gravels in Alberta river beds. Alberta Research Council Bulletin 41, 151 p.

Halferdahl L.B. 1965. The occurrence of gold in Alberta rivers. Alberta Research Council Open File Report 1965-11, 22 p.

Anomaly No.:

P13

AGS ID:

Peace River-11 (Edwards, 1990)

10TM (UTM):

377344E, 6413731N (495923E, 6414425N - Zone 11)

Type of Exposure:

river; island near upstream end

Chemical Analysis:

assays: 35-60 mesh = nil mg/cu yd 1.7 cu ft; 60-120+(-120) mesh = 7.075 mg/cu yd (16.6 cu ft); *total* = 7.075 mg/cu yd

References:

Shaw J. and Kellerhals R. 1982. The composition of Recent alluvial gravels in Alberta river beds. Alberta Research Council Bulletin 41, 151 p.

Halferdahl L.B. 1965. The occurrence of gold in Alberta rivers. Alberta Research Council Open File Report 1965-11, 22 p.

Anomaly No.:

P14

AGS ID:

Peace River-12 (Edwards, 1990)

10TM (UTM):

408662E, 6457754N (525931E, 6459386N - Zone 11)

Type of Exposure:

river; island near upstream end

Chemical Analysis:

assays: 35-60 mesh = nil mg/cu yd (4.2 cu ft); -60 mesh = 0.060 mg/cu yd (4.2 cu ft); *total* = 0.060 mg/cu yd

References:

Shaw J. and Kellerhals R. 1982. The composition of Recent alluvial gravels in Alberta river beds. Alberta Research Council Bulletin 41, 151 p.

Halferdahl L.B. 1965. The occurrence of gold in Alberta rivers. Alberta Research Council Open File Report 1965-11, 22 p.

Anomaly No.:

P15

AGS ID:

Peace River-14 (Edwards, 1990)

10TM (UTM):

474155E, 6468543N (591100E, 6472103N - Zone 11)

Type of Exposure:

river; island near upstream end

Chemical Analysis:

assays: 35-60 mesh = nil mg/cu yd (4.2 cu ft); -60 mesh = 0.060 mg/cu yd (4.2 cu ft); *total* = 0.060 mg/cu yd

References:

Shaw J. and Kellerhals R. 1982. The composition of Recent alluvial gravels in Alberta river beds. Alberta Research Council Bulletin 41, 151 p.

Halferdahl L.B. 1965. The occurrence of gold in Alberta rivers. Alberta Research Council Open File Report 1965-11, 22 p.

Anomaly No.:

P16

AGS ID:

Peace River-16 (Edwards, 1990)

10TM (UTM):

609564E, 6522194N (378821E, 6525151N - Zone 12)

Type of Exposure:

river; point bar

Chemical Analysis:

assays: 35-60 mesh = nil mg/cu yd (4.2 cu ft); -60 mesh = 0.386 mg/cu yd (4.2 cu ft); *total* = 0.386 mg/cu yd

References:

Shaw J. and Kellerhals R. 1982. The composition of Recent alluvial gravels in Alberta river beds. Alberta Research Council Bulletin 41, 151 p.

Halferdahl L.B. 1965. The occurrence of gold in Alberta rivers. Alberta

Research Council Open File Report 1965-11, 22 p.

Anomaly No.: **P17**
AGS ID: Peace River-17 (Edwards, 1990)
10TM (UTM): 659162E, 6550656N (430046E, 6550604N - Zone 12)
Type of Exposure: river; island upstream end
Chemical Analysis: assays: 35-60 mesh = nil mg/cu yd (4.2 cu ft); 60 mesh = 0.060 mg/cu yd (4.2 cu ft); *total* = 0.060 mg/cu yd
References: Shaw J. and Kellerhals R. 1982. The composition of Recent alluvial gravels in Alberta river beds. Alberta Research Council Bulletin 41, 151 p.
Halferdahl L.B. 1965. The occurrence of gold in Alberta rivers. Alberta Research Council Open File Report 1965-11, 22 p.

Anomaly No.: **P18**
AGS ID: Peace River-18 (Edwards, 1990)
10TM (UTM): 697959E, 6536293N (467913E, 6533905N - Zone 12)
Type of Exposure: river; island upstream end
Chemical Analysis: assays: 35-60 mesh = nil mg/cu yd (4.2 cu ft); -60 mesh = 0.514 mg/cu yd (4.2 cu ft); *total* = 0.514 mg/cu yd
References: Shaw J. and Kellerhals R. 1982. The composition of Recent alluvial gravels in Alberta river beds. Alberta Research Council Bulletin 41, 51 p.
Halferdahl L.B. 1965. The occurrence of gold in Alberta rivers. Alberta Research Council Open File Report 1965-11, 22 p.

Anomaly No.: **P19**
AGS ID: Smoky River-3 (Edwards, 1990)
10TM (UTM): 295727E, 6116011N (423003E, 6114426N - Zone 11)
Type of Exposure: river; island upstream end
Chemical Analysis: assays: 18-35 mesh = nil mg/cu yd (8.0 cu ft); 35-60 mesh = nil mg/cu yd (20.0 cu ft); -60 mesh = 0.878 mg/cu yd (20.0 cu ft); *total* = 0.878 mg/cu yd
References: Shaw J. and Kellerhals R. 1982. The composition of Recent alluvial gravels in Alberta river beds. Alberta Research Council Bulletin 41, 151 p.
Halferdahl L.B. 1965. The occurrence of gold in Alberta rivers. Alberta Research Council Open File Report 1965-11, 22 p.

Anomaly No.: **P20**
AGS ID: Smoky River-5 (Edwards, 1990)
10TM (UTM): 299590E, 6149046N (425916E, 6147558N - Zone 11)
Type of Exposure: river; point bar
Chemical Analysis: assays: 18-35 mesh = nil mg/cu yd (8.0 cu ft); 35-60 mesh = 0.149 mg/cu yd (20.0 cu ft); -60 mesh = 1.931 mg/cu yd (20.0 cu ft); *total* = 2.080 mg/cu yd
References: Shaw J. and Kellerhals R. 1982. The composition of Recent alluvial gravels in Alberta river beds. Alberta Research Council Bulletin 41, 151 p.

Halferdahl L.B. 1965. The occurrence of gold in Alberta rivers. Alberta Research Council Open File Report 1965-11, 22 p.

Anomaly No.:

P21

AGS ID:

Smoky River-6 (Edwards, 1990)

10TM (UTM):

335164E, 6165784N (460994E, 6165314N - Zone 11)

Type of Exposure:

river; point bar

Chemical Analysis:

assays: 18-35 mesh = nil mg/cu yd (8.0 cu ft); 35-60 mesh = 0.027 mg/cu yd (20.0 cu ft); -60 mesh = 1.107 mg/cu yd (20.0 cu ft); *total* = 1.134 mg/cu yd

References:

Shaw J. and Kellerhals R. 1982. The composition of Recent alluvial gravels in Alberta river beds. Alberta Research Council Bulletin 41, 151 p.

Halferdahl L.B. 1965. The occurrence of gold in Alberta rivers. Alberta Research Council Open File Report 1965-11, 22 p.

Anomaly No.:

P22

AGS ID:

Smoky River-7 (Edwards, 1990)

10TM (UTM):

347169E, 6214359N (471591E, 6214221N - Zone 11)

Type of Exposure:

river; island bar, upstream end

Chemical Analysis:

assays: 18-35 mesh = nil mg/cu yd (8.0 cu ft); 35-60 mesh = 0.014 mg/cu yd (20.0 cu ft); -60 mesh = 0.756 mg/cu yd (20.0 cu ft); *total* = 0.770 mg/cu yd

References:

Shaw J. and Kellerhals R. 1982. The composition of Recent alluvial gravels in Alberta river beds. Alberta Research Council Bulletin 41, 151 p.

Halferdahl L.B. 1965. The occurrence of gold in Alberta rivers. Alberta Research Council Open File Report 1965-11, 22 p.

Anomaly No.:

P23

AGS ID:

Smoky River-8 (Edwards, 1990)

10TM (UTM):

354499E, 6223864N (478644E, 6223936N - Zone 11)

Type of Exposure:

river; island bar

Chemical Analysis:

assays: -60 mesh = 1.359 mg/cu yd (14.9 cu ft)

References:

Shaw J. and Kellerhals R. 1982. The composition of Recent alluvial gravels in Alberta river beds. Alberta Research Council Bulletin 41, 151 p.

Halferdahl L.B. 1965. The occurrence of gold in Alberta rivers. Alberta Research Council Open File Report 1965-11, 22 p.

Anomaly No.:

P24

AGS ID:

Wapiti River-4 (Edwards, 1990)

10TM (UTM):

288256E, 6113523N (415607E, 6111726N - Zone 11)

Type of Exposure:

river; point bar

Chemical Analysis:

assays: 18-35 mesh = nil mg/cu yd (8.0 cu A); 35-60 mesh = 0.378 mg/cu yd (20.0 cu ft); -60 mesh = 0.905 mg/cu yd (20.0 cu ft); *total* = 1.283 mg/cu yd

References:

Shaw J. and Kellerhals R. 1982. The composition of Recent alluvial gravels in Alberta river beds. Alberta Research Council Bulletin 41, 151 p.

Halferdahl L.B. 1965. The occurrence of gold in Alberta rivers. Alberta Research Council Open File Report 1965-11, 22 p.