GEOLOGY
AND
METALLIC MINERAL POTENTIAL
OF NORTHEASTERN ALBERTA

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ABSTRACT

This report provides a general background for geologists unfamiliar with the region. It contains an extensive bibliography to the publications which supply our knowledge on Alberta's Shield including assessment reports.

The exposed Canadian Shield of northeastern Alberta consists of a north-trending belt of Archean granite gneisses intruded by Aphebian granitoids. South of Lake Athabasca an angular unconformity separates the Helikean Athabasca Group from the underlying Shield rocks. Basement rocks outcrop both north (exposed Shield) and south (Marguerite River area) of the basin structure (Athabasca basin) in which the Helikean rocks were deposited. Geophysical information for northeastern Alberta includes regional magnetic, gravity and gamma-ray data and local electromagnetic and radiometric data from prospecting.

During routine geological mapping in the region by the Alberta Research Council over 200 mineral showings were identified. No attempt was made to prospect favourable areas nor were areas investigated between traverses at the time. In some cases these showings were prospected later by exploration interests and assessment reports filed. In thirty-four cases these prospects were seen as anomalous and further work conducted. None of these has been taken to a prospect stage.

The greatest potential for metallic minerals lies within the low grade and high grade metasedimentary rocks. The majority of high grade metasediments have not been explored. If the mafic mylonites south of Lake Athabasca are derived from metasediments or metavolcanics and are associated with faults they are also excellent exploration targets.

Zones of radioactivity are associated with massive biotite granites and faults and eight of the anomaly records appear to be associated with faults, shear zones or mylonites. Faults and shear zones are favourable targets and merit close examination.

There is a strong foundation of fundamental geological information on the exposed and shallow Shield of northeastern Alberta. Although the purpose of the original mapping in the area was research and not exploration, hundreds of mineral showings were identified. This appears to have aided or initiated mineral exploration by industry. More focused investigation on the areas or formations with probable mineral potential should be sponsored and undertaken by the Provincial or Federal governments as the next step in attracting further industrial interest.

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Introduction

Alberta is a superior target for hydrocarbon resources but expectations traditionally have been low for the discovery of metallic mineral resources. Perhaps this is because the Canadian Shield, Canada's main metallic mineral supplier, comprises only a small part of Alberta. Perhaps the lack of volcanogenic belts makes it less favourable as a real or perceived target for exploration. The very lack of a producing mine may have militated against the exploration effort needed to ever find one. For whatever reasons, few companies have committed time or money in the pursuit of mineral deposits in the northeast region of the province.

This report is a brief summary and review of the geology and especially the economic geology related to the metallic mineral potential of the northeastern region of Alberta (figure 1). It does not contain information on new mapping or analyses nor is it a comprehensive metallogenic study of the region. It is a synthesis of the public reporting to date on the economic geology of the region. The report was written for geologists unfamiliar with the region who wish to know more about its potential. It is a good place to start as it provides a general background and contains numerous references to the actual reports which contain much of our knowledge on Alberta's Shield.

Previous Work

The primary sources of information used in this report are: the thirty-six district geological maps published as part of twelve Alberta Research Council Earth Science or Preliminary reports on the exposed Shield (geology and mineral showings) by Godfrey or Godfrey and others (1961-1984); two Alberta Research Council summary maps (geology; mineral showings) by Godfrey (1986); two Alberta Research Council Bulletins on the Athabasca Group and covered basement by Wilson (1985, 1986); four Alberta Research Council Bulletins on various aspects of the exposed Shield (petrology and geochemistry; deformation; metamorphism; and geophysics) by Goff et. al. 1986, Langenberg 1983, Langenberg and Nielsen 1982 and Sprenke et al 1986 and the Alberta Research Council's Mineral Deposits and Occurrences data base (showings and occurrences).

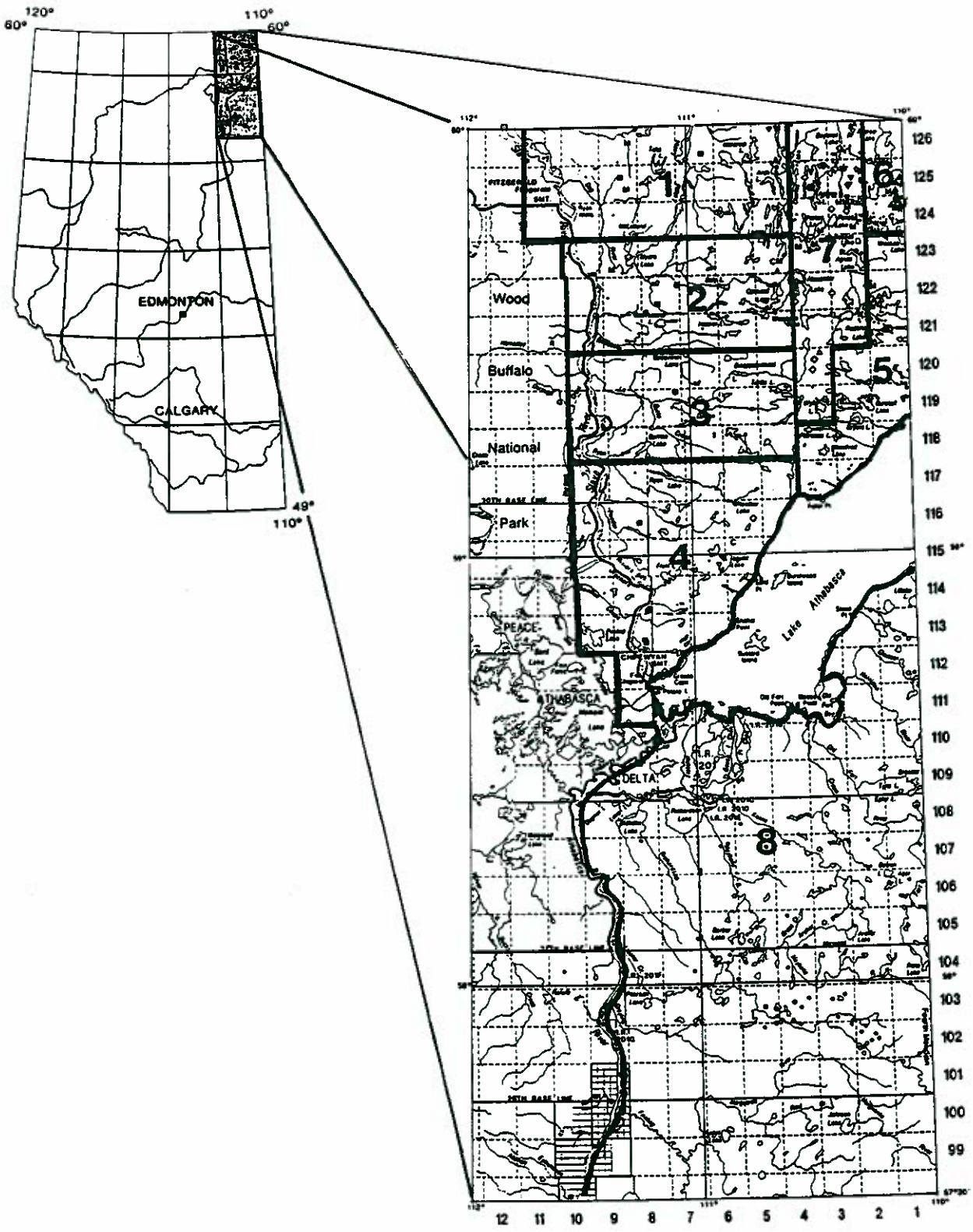

Figure 1. Location of study region and index map to areas described in Economic Geology chapter.

Limited prospecting has been done in the area. Current assessment reports are submitted to Alberta Energy. Upon expiry of a lease the assessment report is sent to the Alberta Geological Survey for filing. Of these reports thirty-four were identified that suggested the investigation generated some anomalous results (table 1). All references used in the preparation of this report plus many other sources of data are listed in the Appendices A, B and C.

Geological overview

Geology north of Lake Athabasca

Information on the geology of the Precambrian Shield north of Lake Athabasca is taken from the work of Godfrey (1958a, 1958b, 1961, 1962, 1963, 1965, 1978, 1984 and 1986) and Peikert (1961). The exposed Shield (figure 2) forms part of the Churchill Structural Province and lies within the Athabasca Mobile Belt (Wilson 1986). It consists of a north-trending belt of Archean granite gneisses intruded by an Aphebian granitoid batholithic complex.

The basement migmatitic gneissic belt consists of classic granitic gneisses with minor components of small granitoid bodies, high grade metasediments and amphibolite. This basement complex probably represents multiple cycles of sedimentation, intrusion, deformation and metamorphism, all rock units have been affected by ductile or brittle deformation.

The granitoid complex west of the gneissic belt is dominated by the Slave and Arch Lake Granitoids and includes the LaButte Granodiorite and Francis Granite (figure 2). It appears that the granitoids are ultrametamorphic partial-melt derivatives from the protolithic granite gneisses. The major contact between the granitoids and the gneissic belt is intrusive, with gneissic wall wedges protruding into the granitoids.

Granitoids east of the gneissic belt include the Wylie Lake and Colin Lake Granitoids (figure 2). This large band of relatively homogeneous porphyroblastic biotite granites overlies the granite gneiss complex. These rocks are metamorphic equivalents of highly deformed, low-grade metasedimentary and metavolcanic rocks in the Waugh Lake area (T 124-125 R 1, figure 2). The rocks of the Waugh Lake area probably represent a sedimentary and volcanic cycle much younger than that represented by the

high grade metasedimentary rocks in the granite gneiss complex (Peikert 1961, Godfrey 1963).

Along the north shore of Lake Athabasca the gneissic basement complex and younger granitoids are unconformably (?) overlain by low-grade metasedimentary rocks of the Burntwood Group of probable late Aphebian age.

The shoreline of Lake Athabasca in the Fort Chipewyan area approximately coincides with the erosional edge of unmetamorphised sandstones of the Athabasca Group (Helikian age). The Athabasca Group is found insitu at one place north of the lake, just west of Fidler Point but concentrations of angular sandstone rubble in several other places suggest that other areas are underlain by the Athabasca Group. A well-developed regolith has been mapped beneath the Athabasca sandstone at Greywillow Point (T 118, R 1) on Lake Athabasca. (Godfrey and Langenberg 1986; Godfrey 1987a, 1984, 1980a and 1958).

Geology south of Lake Athabasca

South of Lake Athabasca four formations of the Helikean Athabasca Group are present. From the base these formations are the Fair Point, the Manitou Falls, the Wolverine Point and the Locker Lake. The siltstones and shales of the upper member of the Wolverine Point Formation are tuffaceous in nature and are believed to have been deposited under nearshore marine conditions. The other formations within the Athabasca Group were deposited in a fluvial setting (Wilson 1985).

An angular unconformity separates the Athabasca Group from the underlying Shield rocks of the Churchill Structural Province. The basement rocks outcrop both north and south of the basin structure (north of Lake Athabasca and the Marguerite River area) in which the Helikean rocks were deposited (Wilson 1985).

Information on the basement geology (figure 2) is derived from the work of Wilson (1986) beneath Athabasca Group cover and from Godfrey (1970) on exposed basement in the Marguerite River area (figure 2). The nomenclature used by Wilson (1986) differs from that employed by Godfrey north of Lake Athabasca but is broadly equivalent.

The Fishing Creek Granitoid, Alkali Feldspar rich Granitoid, Grey Foliated Granitoid and Wylie Lake Granitoid of Wilson (1986) as used in figure 3

south of Lake Athabasca are probably all equivalent to phases of the Wylie Lake pluton exposed north of the lake as described by Godfrey (1980b and 1986).

The mylonitic rocks of figure 3 south of Lake Athabasca are broadly equivalent to the Granite Gneisses and High grade Metasedimentary Rocks of Godfrey (1986) as shown on figure 3 north of Lake Athbasca. The mylonitic rocks south of Lake Athabasca can be divided into a mafic and a felsic type (Wilson 1986). The mafic mylonites predominate and may have been derived from a granite gneiss or High grade Metasedimentary Rocks. The felsic variety were probably derived from granitoid rocks (Wilson 1986).

Godfrey (1970) in his mapping of the exposed Shield in the Marguerite River area described the bulk of the granitoids as undifferentiated Aphebian/Archean (figure 2). Wilson (1986) implies that the granitoid rock in the Marguerite River area is part of the Wylie Lake pluton. This interpretation was used for figure 3 as it provides continuity with Wilson's interpretation of the sub-Athabasca Group basement in the remainder of the area.

Structure and geology of specific areas

Region north of Lake Athabasca

Northern and northwestern area (T 121-126, R 4-9)

The northern and northwestern part of the area (T 121-126, R 4-9) is crossed by north- to northeast-striking, wide regional shear zones (figure 4, Godfrey and Langenberg 1986). Three major faults cut the area: the Allan, the Warren and the Rutherford Faults (Godfrey 1958). The Rutherford Fault trends southwesterly through T 125, R 8, turns south and passes along strike into the course of the Slave River. The Warren Fault has two distinct planes of shearing, the most westerly clearly delineated by the Leland Lakes system (Godfrey 1958) and forms a complex boundary between the major bodies of Slave and Arch Lake Granitoids (Leland Lakes area, figures 2, 3 and 4; Godfrey and Langenberg 1986). The Allan Fault is expressed as a shear zone up to 8 km wide and is often traced by lakes controlled by the structure, for example Charles Lake. In the northern area the Allan Fault is formed of a number of well-defined individual parallel faults (figure 4, Godfrey 1958). The Allan Fault lies largely within the main granite gneiss belt (vicinity of Mercredi and Charles

Lakes, figures 2, 3 and 4) These shear zones are mylonitic and represent a deep-seated environment of ductile shear (Godfrey and Langenberg 1986).

North central area (T 121-126, R 2-4)

In the north central part of the region the oldest rocks are contained in the granite gneiss complex. Repeated sedimentation, metamorphism and intrusion have yielded a welded, heterogeneous mixture of para- and ortho-gneisses composed of biotite and hornblende granite gneisses with minor bands of metasedimentary rocks and amphibolites. The metasedimentary rocks in the complex represent either relatively well-preserved remnants of the paragneissic material or a younger series of sediments which were infolded and downfaulted during the late history of the gneisses or both. The history of the amphibolites is more complex. Amphibolites may have persisted from the paragneissic parent material stage (volcanic material) and may also have intruded the derived paragneissic rocks. Subsequent cataclastic deformation in a deep-seated zone resulted in the formation of four mylonite bands (three major bands are shown on figure 4) Rocks involved in these mylonite bands as parental material include granite gneisses, biotite granite, metasedimentary rocks of schistose and siliceous character and basic rocks probably partly of amphibolitic character. The mylonitic bands extend tens of kilometres in length and are over a kilometer in width. Restricted reactivated fault movements are apparent in the formation of narrow secondary mylonites and breccias within the mylonite bands. Young granites (for example the Arch Lake Granite) have intruded the other rock types in the complex. These granites are relatively unaffected by large-scale intense cataclasis and are believed to be post-deformational in age. Masses of these younger granites are typically elongated in outline and conform to the northerly regional trend. Later fault movements in this region at a high crustal level are evident from breccia development in the mylonite zones and from cross-faults where some rock bands are terminated or their contacts displaced (Godfrey 1966).

Central and west central area (T 113-120, R 3-8)

The area consists of three major belts from west to east: the granitoids dominated by the Slave Granitoids and the Chipewyan Red Granite (figures 2 and 3), a migmitite zone consisting of high grade metasediments interspersed with granitoid masses (figures 2, 3 and 4) and a granite gneiss belt adjacent to Lake Athabasca (figures 2 and 3). The bedrock has been affected by faults that trend either parallel or pependicular to the

regional foliation. A regional mylonitic fault zone trends northeast and north-northeast through the granite gneiss belt (figures 2, 3 and 7) (Godfrey 1984 and 1980a).

The central and west central part of the area north of Lake Athabasca is crossed by regional faults of two principal orientations, north to northeasterly and west to west northwesterly. The latter is the more common orientation. The Allan Fault, represented by a prominent mylonite zone and localized fault surfaces trends northeast to northerly through the granite gneiss belt. (figure 4; Godfrey 1987a).

Eastern area (T 117-126, R1-2)

The area east of the Allan Fault and north of Lake Athabasca is dominated by two granitoid complexes, the Wylie Lake granitoids which make up the bulk of the southeast area (Godfrey 1980b) and the Colin Lake Granitoids which occupy the narrower northeastern slice (figure 3, Godfrey and Peikert 1964). The dominant structural feature in the Colin Lake area (T 121-122 R 1) is the Colin Lake synclinorium whose folded axis plunges east, and trends northeast, east and southeast in passing from west to east (Godfrey and Peikert 1964). In the St. Agnes Lake (T 123, R 1) and Andrew Lake (T 124-125, R 1) areas a system of north-northwest trending faults cut the prevailing northerly strike of the major rock units (Godfrey and Peikert 1963; Godfrey 1963). The Bonny Fault is one such north-northwest trending fault. It extends from the north end of Bayonet Lake (T 126, R 2) through the south end of Andrew Lake. The related minor features of the Bonny fault- brecciation, quartz stock-work, mylonization, hematization, chloritization and marginal shears, mark this fault as a major structure.

Region south of Lake Athabasca

Magnetic data south of Lake Athabasca suggests the Wylie Lake pluton below Athabasca Group cover may be marked by northwest oriented mylonite bands and shear zones (linear magnetic highs) and non-linear granite gneiss zones. The northwest orientation occurs on the axis of what appears to be a major flexure in the Granite Gneiss belt (figure 2; Wilson, 1986). Two major faults were postulated on the basis of linear magnetic lows, offsets of magnetic highs and drill hole data (Wilson 1986). A southwest trending fault in the southeast of the area (figure 4; T 102, R 1 to T 99, R 4) is responsible for the offset in the mylonite zone

which is exposed in the Marguerite River area. This fault is in turn offset by a southeast trending fault which runs parallel to the Richardson River (figure 4). This fault or splays from it are responsible for the mylonitic rocks encountered in the drill holes in the northern half of T 104, R 6 (Wilson 1986). The fault parallel to the south shore of Lake Athabasca is postulated as an extension of the Black Bay Fault in Sasakatchewan. The fault just south of Lake Athabasca is a probable extension of the Grease River Shear Zone.

Metamorphism

The region has undergone a two-cycle polyphase metamorphism. Geochronology and electron microprobe mineral analyses show that an Archean high-pressure granulite facies metamorphism was followed by an Aphebian moderate-pressure granulite facies metamorphism. Mineral assemblages show that the latter retrogressed through amphibolite facies and greenschist facies conditions. From Rb-Sr isochron analyses, the moderate-pressure granulite facies event was dated at 1900 Ma. K-Ar dates on biotite and horneblende reveal that the greenschist facies and closure of the K-Ar system occurred at about 1800 Ma. Those events are coincident with the end of a widespread and severe thermal event (the Hudsonian Orogeny) (Langenberg and Nielsen 1982).

Geophysical information

Geophysical information on the Canadian Shield of northeastern Alberta includes regional magnetic, gravity and gamma-ray data (Sprenke, Wavra and Godfrey 1986) plus local electromagnetic and radiometric data from assessment work.

Gravity and magnetic trends (figures 5 and 6) have helped in the regional understanding and history of this part of the Churchill Province. Sprenke et al (1986) suggest gravity field measurements and specific gravity data from outcrop are consistent with the hypothesis that diapirism is responsible for emplacement of the granitoid domes in the Alberta Shield. They interpret gravity data in the region to suggest that the gravity field was shaped by initial north to northeast oriented structural fabric resulting from regional tectonic stresses and was then locally disrupted and reoriented by diapiric plutonism particularly the processes and products related to High grade metamorphism. The regional northeasterly trending linear magnetic signature (figure 6) is thought to be related to

regional tectonic features such as ancient troughs, geosynclinal structures and orogenic fronts (Sprenke, Wavra and Godfrey 1986).

The strong, arcuate gravity high, the Barrow-Ashton Lakes Gravity High on figure 5, which passes through the area correlates with granulite facies granitoids and granite gneisses. The Barrow-Ashton Lakes Gravity High correlates with a region of high rock density and low K40. High K40 values (> 2.0%) are associated with low-density rocks and possible potassium metasomatism which the region of the gravity high feature may have escaped. Bouger gravity values range from -60 to -40 mgal in the Alberta Shield (Sprenke et. al. 1986). Gravity and magnetic data for the region show some agreement. Gravity lows tend to correspond with magnetic lows over many granitoid masses and gravity highs tend to coincide with magnetic highs related to either granite gneisses or certain granitoids (exceptions occur to both). Many areas do have inverse geophysical expressions (gravity highs associated with surface rock density lows and vice versa) which suggests that surface rock densities in many cases do not reflect complex geochemical and geophysical environment that underlies many areas. The regional gravity data are inadequate to identify most fault zones and mylonite zones.

Structures and the distribution of rock groups correlate with the pattern of magnetic anomalies and contours on aeromagnetic maps. Locally aeromagnetic values can be related to bedrock features mapped in outcrop. Magnetic field patterns result from a combination of geological factors including regional metamorphism, local shear and plutonic intrusion. Magnetic lows result from metasedimentary bands, mylonitic zones or low-susceptibility granitoids. For example the porphyroblastic biotite granites, massive biotite and leucocratic granites of the Colin Lake Granitoids have a uniform low aeromagnetic response and metasedimentary rocks typically have a linear ridge and valley aeromagnetic contour pattern of low relief. Magnetic highs result from granite gneiss and high-susceptibility granitoids. The granite gneiss has a linear ridge and valley aeromagnetic contour pattern and metasedimentary rocks have a linear ridge and valley aeromagnetic contour pattern of high relief. Regional faults such as the Bonny fault have a low aeromagnetic response which contrasts with the response from rocks of the granite gneiss terrain (Godfrey and Peikert 1963; Sprenke, Wavra and Godfrey 1986). Examples of each of these correlations is provided in Sprenke et al (1986) and a detailed chart of magnetic susceptibility values and ranges is given for each rock unit described in the district maps of Godfrey.

Areas within the metasedimentary rock bands which show strong positive magnetic anomalies are of exploration interest in that they represent local concentrations of magnetite and may be clues to syngenetic base metal mineralization. Some magnetic lows may be related to mineral alteration, possibly of hydrothermal origin.

Aeromagnetic data has been extremely useful in correlating and extending rocks units, shear zones and faults, especially in covered areas to the west and south of the exposed Shield. In the Murdoch Creek area a basic intrusion has been interpreted based on a very large, positive magnetic anomaly. The anomaly is peculiar for this region and occurs beneath Paleozoic cover (Sprenke, Wavra and Godfrey 1986). Typically the Archean granite gneisses have higher magnetic susceptibilities than the younger granitoid masses. This information was used by Wilson (1986) in his interpretion of granitic gneisses, metasediments, mylonitic bands and faults under Athabasca Group cover.

Airborne radiometric data suggest that uranium is concentrated in six areas in the exposed Shield area. The primary sources of radioactivity include pegmatitic phases of both granitoid and high grade metasediments, rock contacts, metasedimentary inclusions in granitoids and fault zones (Sprenke, Wavra and Godfrey 1986).

Economic geology

In general the greatest potential for metallic minerals lies within the low grade and high grade metasedimentary rocks. (Godfrey and Langenberg 1986). It appears that sulfide mineralization other than pyrite is associated only with metasedimentary rocks (Godfrey 1963). The majority of high grade metasediments have not been explored; systematic prospecting of these bands should yield additional anomalies (Godfrey 1987a). If the mafic mylonites south of Lake Athabasca are derived from metasediments or metavolcanics and are associated with faults they form areas which are excellent exploration targets. (Wilson 1986).

Zones of radioactivity are associated massive biotite granites and faults as well as with metasedimentary rocks (Godfrey 1963). Mineralization was noted in the course of systematic traverses crossing such units but favourable areas were not prospected nor were areas investigated between traverses (Godfrey 1963 and 1961). Faults and shear zones are favourable targets and merit close examination (Godfrey 1984).

The following section of the report describes mineral showings mapped by the Alberta Research Council and anomalous occurrences investigated by industry and recorded in the Mineral Assessment Files of the Alberta Research Council. The region has been divided into eight areas (figure 1) to accomodate description and to give some correspondence to the distribution of rock units.

(1) Northwest area (T 124-126, R 4-10)

During the course of geological mapping limited areas of secondary uranium stains, scattered molybdenite and dispersed minor graphite (figure 7) were found within the Slave granitoids (figures 2 and 3). Graphite was noted in the high grade sedimentary band west of Leland Lakes. The high grade metasediments were not explored by Alberta Research Council personnel mapping the area. Systematic prospecting could yield other anomalies (Godfrey and Langenberg 1986).

Uranium was found in the area by prospectors in the late 1950's (Godfrey and Langenberg 1986). Five anomalies are on record in the Mineral Assessment Files of the Alberta Research Council for this area (table 1, 24-28). All exploration was based on uranium as the potential mineral and all projects employed airborne radiometrics as the survey type. Two records were for occurrences in the granite gneisses, one in the Slave granitoids and two were in the vicinity of the northern portion of the Rutherford fault.

(2) North central area (T 121-123, R 4-9)

Many quartz veins are parallel and closely associated with the Allan Fault Shear Zone in the vicinity of Woodman Lake.(figure 4). An unusual amount of allanite was noted in both Biotite and Hornblende Granite Gneisses in this part of the Granite Gneiss belt (T. 122, R 3-4; figure. 7). Minor amounts of molybdenite, chalcopyrite, and arsenopyrite are dispersed in Hornblende Granite Gneiss near the partly faulted contact of the Arch Lake Granitoids within the Granite Gneiss belt (T 123, R 4, figures 2,3 and 7). These mineral occurrences are situated in a zone of faults that parallel and lie close to the west side of the Allan Fault. (Godfrey and Langenberg 1987b)

Copper (chalcopyrite) mineralization has been found in the Paleozoic sedimentary rocks immediately overlying the regolith developed in the Precambrian Shield crystalline rocks (T 122, R 9, figure 7; Godfrey

Table 1. Anomaly records from the Alberta Mineral Deposits and Occurrences data base. Records are from mineral assessment reports on file at the Alberta Geological Survey.

Anomaly Number	Location T	R	Survey Method and Type	Geological unit[1]	AMD&O[2]
1	124	1	Airborne, ground: scintillometer	CL (pegmatite)	A11270
2	124	1	Airborne: scintillometer	CL (quartzite)	A4070
3	124	2	Airborne: scintillometer; ground: drilling	GN	A4625
4	125	2	Airborne, ground: scintillometer	GN (pegmatite)	A4944
5	125	2	Airborne: radiometric; ground: resampling	GN	A12191
6	125	2	Ground: soil geochemistry	GN	A12504
7	125	2	Airborne: scintillometer; ground: trenching	GN	A5367
8	125	1	Airborne: radiometric, electromag.; ground: scintillometer, trenching	LM	A5477
9	124	1	Airborne: radiometric, electromag.; ground: scintillometer	LM	A5722
10	126	1	Airborne: radiometric, electromag.; ground: scintillometer, electromag.	CL	A5944
11	125	1	Airborne: radiometric, electromagnetic	LM	A6170
12	126	2	Airborne: radiometric, electromag.; ground: scint., soil geochem	CL	A6465
13	125	3	Airborne: radiometric, electromag.; ground: mag.., electromag.	GN	A6820
14	125	3	Airborne: radiometric, E.M..; ground: mag., E.M., soil geochem.	GN	A7140
15	124	1	Airborne: radiometric, electromag.; ground: scint.	CL (fractures)	A7352
16	124	3	Airborne: radiometric; ground: water geochemistry	HM (mylonite)	A7679
17	123	3	Airborne: radiometric; ground: water geochemistry	GN (mylonite)	A7862
18	123	2	Airborne: radiometric; ground: water geochemistry	GN (mylonite)	A7952
19	123	2	Airborne: radiometric; ground: water geochemistry	GN (pegmatite)	A8264
20	119	3	Ground: scintillometer	GN	A8951
21	119	3	Airborne: radiometric	WL	A9059
22	119	3	Airborne: radiometric	WL	A8640
23	118	2	Airborne: radiometric	WL	A9269
24	125	4	Airborne: radiometric	GN	A9594
25	125	4	Airborne: radiometric	GN	A9890
26	126	8	Airborne: radiometric	SG	A10121
27	126	8	Airborne: radiometric	? (fault?)	A10242
28	126	8	Airborne: radiometric	? (fault?)	A10537
29	107	2	Airborne: radiometric, electromagnetic, magnetometer	MF	A10990
30	107	2	Airborne:, electromagnetic, magnetometer	MF	A2225
31	117	3	Airborne radiometric; ground: scintillometer	WL (pegmatite)	A2494
32	117	3	Airborne radiometric; ground: scintillometer	WL (pegmatite)	A11602
33	120	5	Ground: scintillometer	SG (shear)	A11816
34	104	6	Airborne: electromagnetic, mag.; ground: electromagnetic, drilling	? (mylonite?)	A12656

[1]units from figure 2; CL= Colin Lake Granitoids, WL= Wylie Lake Granitoids, SG= Slave Granitoids, GN= Granite Gneisses, LM= Low Grade Metasedimentary Rocks, HM= High Grade Metasedimentary Rocks, MF= Manitou Falls

[2]AMD&O (Alberta Mineral Deposits and Occurrences data base) reference number

1973). Secondary and primary copper mineralization are present, although not all chalcopyrite is accompanied by secondary staining. The mineralization is stratiform and largely restricted to a 30 cm thick dolomitic bed beneath upper flaggy limestone and close to thin shale. Copper mineralization is low grade and dispersed. It probably averages less than 0.3 % even over a selected bed thickness of 10 cm. The mineralization could be widespread however and therefore all of the sedimentary rocks, granite wash and regolith should be checked wherever feasible. (Godfrey and Langenberg 1987b).

(3) Central area (T 118-120, R 4-9)

Many scattered minor uranium occurrences are found in the Slave Granitoids (figure 7) and occurrences of molybdenite are expected but were not observed (Godfrey 1987a).

A radioactive anomaly near Disappointment Lake (table 1, 33) in a mineralized shear zone was explored using scintollometer. Two trenches were later blasted and sampled. Traces of gold and silver were detected and assays returned values of 0.13% U3O8.

(4) Area north of Lake Athabasca (T 115-117, R 4-9; T 113-114, R 5-9; T 111-112, R 7-8)

Scattered uranium mineralization (indicated by secondary uranophane yellow stains and confirmed by geiger counter) was noted in the map area (figure 7) especially within the metasedimentary rocks (figure 2). Although the high grade metasediments have the greatest potential for such radioactive anomalies, major portions of the bands present have not been explored. Minor chalcopyrite showings are associated with some gossans or rusty zones within the high grade metasediments (T 115, R 5 and T 112, R 7, figure 7; Godfrey 1984). The occurrence nearest Fort Chipewyan has been prospected by means of minor exploration trenches and pits. (Godfrey 1980a).

(5) Area northeast of Lake Athabasca (T 117-118, R 1-3; T 119-120, R 1-2; T 121-123, R 1)

Widespread radioactivity and abundant yellow stain on the outcrop was noted to the south and east of Winnifred Lake (T 117, R 2-3) in association with quartz diorite, granitic metasediments and granodiorite (figure 7). Surface exploration by industry in 1970 discovered a highly radioactive Athabasca sandstone boulder about 12 km north-northwest of Fidler Point

(Godfrey 1980). The 3 kg boulder of purple-mauve Athabasca sandstone provided a chemical assay of .43 percent U_3O_8 and no ThO_2.

A great number of moderately radioactive pegmatites and coarse-grained granites with yellow stains are present in the biotite granites throughout the Colin Lake area (figure 7; Godfrey and Peikert 1964).

Six anomalies are recorded for this area (table 1, 20-23, 31, 32). The mineral of interest in all cases was uranium. Prospects were pursued using airborne radiometrics and ground scintillometer.

(6) Northeast area (T 124-126, R 1)

In the low grade metasedimentary rocks near Waugh Lake (T 124-125, R 1) small amounts of arsenopyrite, pyrrhotite, galena, molybdenite and chalcopyrite have been noted (figure 7). At a number of sites east of Waugh Lake (T 124, 125, R 1) pyrrhotite and arsenopyrite have been found in quartzite. Specks of galena and pyrrhotite in sheared and folded quartzites were noted west of Waugh lake (T 124, R 1; Godfrey 1958). Unique to this band is the extensive presence of tourmaline-quartz composite veins which are concentrated on the north shore of the elbow of Waugh Lake. A sample of a composite tourmaline-quartz-arsenopyrite vein in the sedimentary rocks located just east of the fourth meridian north of Waugh Lake yielded small amounts of gold, silver and nickel (Godfrey 1963).

Hematization, feldspathization and chloritization with the breccia and marginal shears of the Bonny fault has the typical appearance of zones associated with uranium mineralzation such as that found in the Beaverlodge district of Saskatchewan to the east. Many zones of high radioactivity were traced over a total strike length of about two miles within the feldspathized high grade metasedimentary band at Spider Lake (T 124, R 2). Radioactivity is concentrated in the pegmatite phases of this metasedimentary band, where minor flakes of molybdenite are also found (Godfrey 1963). The radioactive anomalies were recorded adjacent to the main Bonny fault rather than within it and are coincident with bands of metasedimentary rocks as they abut against the fault (Godfrey 1961). Many low-level radioactive anomalies also occur in an area north and west of Cherry Lake (T 124, R 1; Godfrey 1963).

Flakes of molybdenite were found in a quartz vein and quartz-rich pegmatite within quartzites east of the south end of Andrew Lake (T 125, R 1, figure 7; Godfrey 1958). Specks of galena and chalcopyrite in

quartzose layers in quartz-rich biotite phyllite occur about 1/2 km north of Johnson Lake (T 124, R 1; Godfrey 1958).

Seven anomaly records occur in this area (table 1: 1, 2, 8-11 and 15). The prospects were flown initially with radiometrics or electromagnetics and four were followed by ground scintillometer checks. Three of the prospects were in low grade metasediments (table 1: 8, 9, 11). Trenching and sampling at one site returned low assay values for gold (0.01 oz./T) and silver (0.60 oz./T). The other prospects were associated with pegmatite, high grade metasediments or shear zones.

(7) East central area (T 119-120, R 3, T 121-126, R 2-3)

Small gossan and rusty zones parallel to the rock strike are commonly found in metasedimentary rock bands and are particularly evident in the Sedgwick-Lindgren Lakes band (T 126, R 2 (E1/2)). Pyritization is a common feature and other sulphides such as arsenopyrite (figure 7) smaltite and pyrrhotite were noted at several points in the Sedgwick-Lindgren Lakes band. Quartzite and biotite schist exposed on the southwest shore of Lindgren Lake showed sulfide mineralization within a gossan which yielded small values of nickel, silver and gold (Godfrey 1961).

Five molybdenite occurrences, primarily within metasedimentary rocks, have been noted in an area around Andrew Lake Arm (T 124 (N1/2), R 2) These molybdenite occurrences are apparently on the southern extension of a major metasedimentary band known to contain well-developed gossans and minor sulphides with nickel, gold and silver values (figure 7; Godfrey 1966).

Molybdenite occurrences were noted on the east shore of Potts Lake, west of Potts Lake and at the south end of Charles Lake where they are associated with chalcopyrite. Concentrations of massive arsenopyrite were present in a 3-foot wide zone within a siliceous, chloritic metasedimentary band southwest of Potts Lake (figure 7; Godfrey 1966) Aresenopyrite-bearing grab samples from the south end of Potts Lake were assayed but did not indicate any gold or silver mineralization (Godfrey 1966).

Uranium mineral stains were noted in the gneisses east of Charles Lake and within the high grade metasedimentary rocks (figure 7; Godfrey and Langenberg 1986).

A dozen anomaly records (table 1, 3-7, 12-14, 16-19) were assembled for this region of granite gneisses and metasedimentary bands. In all cases the reported potential mineral was uranium. Radioactive anomalies were associated with pegmatite lenses and mafic bands in the metasediments or gneisses. Airborne radiometrics was invariably followed by ground scintillometer, magnetometer, soil or water geochemistry.

(8) Area south of Lake Athabasca

Uranium exploration has proceeded intermittently in rocks of the Athabasca Group (often referred to as the Athabasca Basin) in Alberta since the 1960's with the discovery of the Rabbit Lake orebody in Saskatchewan. Other deposits have been discovered in Saskatchewan, almost all in proximity to the basal unconformity of the Athabasca Group. Wilson (1986) suggests that exploration should be focused on the unconformity in areas where sandstone cover is less than 600 metres thick, an area of about 6000 km^2. Prime areas include the basin edge and outliers beneath Devonian cover to the west of the Basin or in the area of exposed Shield north of Lake Athabasca. Uranium ore deposits will probably be associated with basement faults, graphitic basement rocks (such as graphitic gneiss) and may have a sericitic and chloritic halo about them. Areas of Aphebian metasediments appear to result in the formation of more numerous and richer deposits although deposits are also found in or above Archean basement (Wilson 1985). Sampling of altered mafic mylonites in one of the drill holes clustered in T 114, R 1 (figure 7) produced uranium assay values up to 292 ppm, gold values of 0.08 oz/ton and enrichment in Ni, Co, Zn, Ag and As. Such enrichment has been found around uranium deposits in Saskatchewan (Wilson 1986).

Other potential mineralization within the Athabasca Basin includes lead/zinc and phosphate. Galena and sphalerite mineralization in a fracture system were detected in a drill hole at 11-35-113-2-W4 (figure 7). Phosphates are associated with the tuffs of the upper member of the Wolverine Point Formation. The presence in core is patchy and sub-economic (Wilson, 1985).

Three anomaly records (29, 30 and 34) with uranium as the potential mineral are listed. In addition major drilling programmes have been undertaken in the region. Results are released upon termination of the confidentiality period. It is beyond the scope of this study to describe more fully the geology and uranium exploration in the Athabasca Basin. Interested parties should contact the Alberta Research Council staff directly.

Summary

The geology, structure, geophysical characteristics and metamorphic history of the Canadian Shield of northeastern Alberta are well documented. During the course of routine geological mapping in the region over 200 mineral showings were identified. No attempt was made to prospect favourable areas nor were areas investigated between traverses. Some exploration was undertaken by companies. About three dozen assessment reports indicate that some anomalous results were obtained during prospecting. None of these was taken to a prospect stage.

The greatest potential for metallic minerals lies within the low grade and high grade metasedimentary rocks. The majority of high grade metasediments have not been explored. If the mafic mylonites south of Lake Athabasca are derived from metasediments or metavolcanics and are associated with faults they are also excellent exploration targets.

Zones of radioactivity are associated with massive biotite granites and faults and eight of the anomaly records appear to be associated with faults, shear zones or mylonites. Faults and shear zones are favourable targets and merit close examination.

There is a strong foundation of fundamental geological information on the exposed and shallow Shield of northeastern Alberta. Most of this work was completed through the Alberta Research Council. Although the purpose of this original mapping was research and not exploration, hundreds of mineral showings were identified. This appears to have initiated the mineral exploration by industry which has taken place to date. More focused investigation on the areas or formations with mineral potential should be sponsored and undertaken by the Provincial or Federal governments as the next step in attracting further industrial interest.

Appendix A

List of Alberta Research Council Publications for Northeast Alberta

List of Alberta Research Council Publications
Northeast Alberta

Contribution Series

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880 Godfrey, J.D. 1979. Chipewyan granite : a building stone prospect in Alberta. CIM Bulletin 72(805): pp. 105-109. Earth Sciences Reports

1041 Langenberg, C.W., and J. Ramsden. 1980. Geometry of folds in granitoid rocks of northeastern Alberta. Tectonophysics 66: pp. 269-285.

1071 Langenberg, C.W., J.D. Godfrey, P.A. Nielsen, and H. Baadsgaard. 1981. Precambrian metamorphic conditions and crustal evolution, northeastern Alberta, Canada. Precambrian Research 16(3): pp. 171-193.

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18 Collins, G.A., and A.G. Swan. 1954. Preliminary report of geological field work, northeastern Alberta, June 30 - August 27, 1953. $5.00

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140 Bayrock, L.A. 1971. Surficial geology of the Bitumount area, Alberta, NTS 74E. $5.00

141 Bayrock, L.A. 1972. Surficial geology of the Fort Chipewyan area, Alberta, NTS 74L. $5.00

145 Bayrock, L.A. 1972. Surficial geology of the Peace Point and Fitzgerald areas, Alberta, NTS 84P and 74M. $5.00

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180 Godfrey, J.D. 1986. Geology of the Precambrian Shield in northeastern Alberta, NTS 74M and NTS 74L. $5.00

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Open File Reports

1972-2 Godfrey, J.D. 1972. Fort Chipewyan ornamental buildingstone project, Chipewyan red granite. $15.00

1973-36 Godfrey, J.D. 1973. Stony Islands copper showing : Slave River, Alberta. $3.00

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1986-13 Various. 1986. The metallic and industrial minerals of Alberta : mineral commodity profile. $2.00

1984-27 Wilson, J.A. 1984. Report on the geology and economic potential of lands around the western end of Lake Athabasca, Alberta. $3.00

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Earth Sciences Reports

58-3 Godfrey, J.D. 1961. Geology of the Andrew Lake north district, Alberta. $8.00

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61-2 Godfrey, J.D. 1963. Geology of the Andrew Lake, south district, Alberta. $10.00

62-1 Godfrey, J.D., and E.W. Peikert. 1963. Geology of the St. Agnes Lake district, Alberta. $8.00

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65-6 Godfrey, J.D. 1966. Geology of the Bayonet, Ashton, Potts and Charles Lake districts, Alberta. $10.00

78-1 Godfrey, J.D. 1980. Geology of the Alexander-Wylie Lakes district, Alberta. $10.00

78-3 Godfrey, J.D. 1980. Geology of the Fort Chipewyan district, Alberta. $10.00

84-2 Godfrey, J.D. 1984. Geology of the Ryan-Fletcher Lakes district, Alberta. $15.00

84-5 Godfrey, J.D. 1987. Geology of the Bocquene-Turtle Lakes district, Alberta. $15.00

84-6 Godfrey, J.D., and C.W. Langenberg. 1987. Geology of the Myers-Daly Lakes district, Alberta. $15.00

84-7 Godfrey, J.D., and C.W. Langenberg. 1986. Geology of the Fitzgerald, Tulip-Mercredi-Charles Lakes district, Alberta. $15.00

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1 Godfrey, J.D. 1958. Aerial photographic interpretation of Precambrian structures north of Lake Athabasca, Alberta. $5.00

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Geochronology of the Canadian Shield in northeastern AlbertaII-Charles-Andrew-Colin Lakes area [abstr.] Baadsgaard, H.; Godfrey, J. Int. Geol. Congr. Abstr.--Congr. Geol. Int., Resumes No. 24, p. 3,1972 Languages: English

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Appendix D

Exploration Permits for Northeast Alberta

EXPLORATION PERMITS
NORTHEAST ALBERTA

GEODIAL SOURCE (APRIL 1990):

EXPL. PERMIT 216, ELDORADO NUCLEAR L, TP103-105 R4-6W4M, 74E/15+74L/02, ALTA, FIELD REPT+8 MAPS+18 PROFILES BY G MITCHELL+P FORTUNA, ALBERTA RES COUN EC MIN FILE U-AF-144(2), 1978 (CONFIDENTIAL, RELEASE DATE 15 FEB 1984) (701648)

EXPL PERMIT 6878110001, S M D MNG CO L, TP108 R8+9W4M, 74L/6, ALTA, SUMMARY REPT+3 MAPS+1 LOG BY T WALKER, ALBERTA RES COUN EC MIN FILE U-AF-162, 1980 (701662)

EXPL PERMIT 244, HUDSON'S BAY OIL+GAS L, TP119+120 R1W4M, 74M/08, ALTA, SUMMARY REPT+34 MAPS BY G KILBY+G WALKER, ALBERTA RES COUN EC MIN FILE U-AF-158, 1979 (CONFIDENTIAL, RELEASE DATE 15 JUNE 1984) (701656)

EXPL PERMIT 223, FLIN FLON MINES L, TP113+114 R1+2W4M, 74L/16, ALTA, SUMMARY REPT+9MAPS+3 SECTIONS BY W NELSON, ALBERTA RES COUN EC MIN FILE U-AF-151, 1978 (CONFIDENTIAL, RELEASE DATE 28 FEB 1984) (701654)

EXPL PERMIT 235, ESSO RES CAN L, TP111+112 R1+2W4M, 74L/09, ALTA, SUMMARY REPT+5MAPS BY M BROWN, ALBERTA RES COUN EC MIN FILE U-AF-157, 1978 (701641)

EXPL PERMIT 217, ELDORADO NUCLEAR L, TP102+103 R5+6W4M, 74E/15, ALTA, PROGRESS REPT+3 MAPS+1 PROFILE BY H LAANELA, ALBERTA RES COUN EC MIN FILE U-AF-145(1),1977 (CONFIDENTIAL, RELEASE DATE 15 FEB 1984 (701649)

EXPL PERMIT 6878110002, S M D MNG CO L, TP103-105 R9-11W4M, 74E/13+14 74L/3+4, ALTA, GEOPHYSICAL REPT+10 MAPS BY R DECARLE, ALBERTA RES COUN EC MIN FILE U-AF-163, 1980 (701663)

EXPL PERMIT 6876120005, NORCEN ENERGY RES L, TP104 R6+7W4M, 74L/2+3, ALTA, YEAREND REPT+1MAP BY G MCWILLIAMS+L SMITH ALBERTA RES COUN EC MIN FILE U-AF-161(2), 1979 (CONFIDENTIAL, RELEASE DATE 30 DEC 1984) (701660)

EXPL PERMIT 6876120004, NORCEN ENERGY RES L, TP105 R7W4M, 74L/03, ALTA, PROPOSAL+4 MAPS BY L SMITH+D SAWYER, ALTA RES COUN EC MIN FILE U-AF-160(1),1978 (CONFIDENTIAL, RELEASE DATE 30 DEC 1984) (701658)

EXPL PERMIT 6876120002, NORCEN ENERGY RES L, TP106+107 R6-8W4M, ALTA, 74L/02+03+06+07, ALTA, YEAR END REPT+3 MAPS BY G MCWILLIAMS, ALBERTA RES COUN EC MIN FILE U-AF-159, 1977 (CONFIDENTIAL, RELEASE DATE 30 DEC 1984) (701657)

EXPL PERMIT 222, FLIN FLON MINES L, TP112+113 R2+3W4M, 74L/09+74L/16, ALTA, SUMMARY REPT+9MAPS+3 SECTIONS BY W NELSON, ALBERTA RES EC MIN REPT U-AF-150, 1978 (CONFIDENTIAL, RELEASE DATE 28 FEB 1984) (701655)

EXPL PERMIT 220, GOLDEN EAGLE OIL+GAS L, TP114+115 R1W4M, 74L/16, ALTA, GEOPHYSICAL REPT+2MAPS BY L HOG, ALBERTA RES COUN EC MIN REPT U-AF-148, 1978 (CONFIDENTIAL, RELEASE DATE 28 FEB 1984) (701652)

EXPL PERMIT 215, ELDORADO NUCLEAR L, TP102+103 RR2-4W4M, 74E/15+74E/16, ALTA, GENERAL FILE+10 MAPS, NO AUTHOR, ALBERTA RES COUN EC MIN FILE U-AF-143(1), 1979 (CONFIDENTIAL, RELEASE DATE 15 FEB 1984) (701646)

EXPL PERMIT 218, ELDORADO NUCLEAR L, TP102 R4W4M, 74E/15, ALTA, EXPLORATION REPT+8 MAPS+13 PROFILES BY P FORTUNA, ALBERTA RES COUN EC MIN FILE U-AF-146(1),1979 (CONFIDENTIAL, RELEASE DATE 15 FEB 1984 (701650)

EXPL PERMIT 216, ELDORADO NUCLEAR L, TP103-105 R4-6W4M, 74E/15+74L/02, ALTA, SUMMARY REPT+1 MAP BY P FORTUNA, ALTA RES COU EC MIN FILE U-AF-144(1), 1979 (CONFIDENTIAL, RELEASE DATE 15 FEB 1984) (701647)

EXPL PERMIT 214, ELDORADO NUCLEAR L, TP101+102 R1-3W4M, 74E/16, ALTA, SUMMARY REPORT +1 MAP BY P FORTUNA, ALBERTA RES COUN EC MIN FILE U-AF-142(2), 1979 (CONFIDENTIAL, RELEASE DATE 15 FEB 1984) (701645)

EXPL PERMIT 214, ELDORADO NUCLEAR L, TP101+102 R1-3W4M, 74E/16, ALTA, GEOPHYSICS REPT+3 MAPS BY P FORTUNA, ALBERTA RES COUN EC MIN FILE U-AF-142(1), 1979 (CONFIDENTIAL, RELEASE DATE 15 FEB 1984) (701644)

EXPL PERMIT 225, ESSO RES CAN L, TP111-113 R1-3W4M, 74L/09+74L/16, ALTA, DRILLING REPT+6 MAPS BY M BROWN, ALBERTA RES COUN EC MIN FILE U-AF-153, 1976 (701643)

EXPL PERMIT 221, GOLDEN EAGLE OIL+GAS L, TP113+114 R1W4M, 74L16, ALTA, GEOPHYSICAL REPORT+2 MAPS BY L HOG, ALBERTA RES COUN EC MIN FILE U-AF-149, 1978 (CONFIDENTIAL, RELEASE DATE 28 FEB 1984) (701651)

EXPL PERMIT 224, MATTAGAMI MINES L, TP106 R1-3W4M, 74L/01, ALTA, GEOLOGY REPT+7 MAPS BY W MERCER, ALBERTA RES COUN EC MIN FILE U-AF-152, 1976 (701639)

EXPL PERMIT 209, NORCEN ENERGY RES L, TP105+106 R1-3W4M, 74L/01, ALTA, YEAR END REPT+3 MAPS+1 CROSS SECTION BY G MCWILLIAMS+ D SAWYER, ALBERTA RES COUN EC MIN FILE U-AF-137(3), 1977 (701638)

EXPL PERMIT 208, NORCEN ENERGY RES L, TP103-105 R1+2W4M, 74E/16+74L/01, ALTA, SUMMARY REPT+2MAPS BY G MCWILLIAMS+L COOL, ALBERTA RES COUN EC MIN FILE U-AF-136(3), 1979 (701637)

EXPL PERMIT 219, GOLDEN EAGLE OIL+GAS L, TP113+114 R1+2W4M, 74L16, ALTA, GEOPHYSICAL REPORT+2 MAPS BY L HOG, ALBERTA RES COUN EC MIN FILE U-AF-147(1), 1978 (CONFIDENTIAL, RELEASE DATE 28 FEB 1984) (701653)

EXPL PERMIT 194, URANERZ EXPL+MNG L, TP113+114 R5+6W4M, 74L/15, ALTA, DRILLING REPT+1MAP BY K LEHNERT-THIEL+B HARMESON+J RICH, ALBERTA RES COUN EC MIN FILE U-AF-122(7), 1977 (CONFIDENTIAL, RELEASE DATE 17 FEB 1983) (701411)

EXPL PERMIT 193, URANERZ EXPL+MNG L, TP114+115 R4+5W4M, 74L/15, ALTA, DRILLING REPT+1MAP BY K LEHNERT-THIEL+B HARMESON+J RICH, ALBERTA RES COUN EC MIN FILE U-AF-121(7), 1977 (CONFIDENTIAL, RELEASE DATE 17 FEB 1983) (701410)

EXPL PERMIT 190, URANERZ EXPL+MNG L, TP117+118 R1+2W4M, 74M/1+8, ALTA, DRILLING REPT+1MAP BY K LEHNERT-THIEL+B HARMESON+J RICH, ALBERTA RES COUN EC MIN FILE U-AF-119(7), 1977 (CONFIDENTIAL, RELEASE DATE 17 FEB 1983) (701409)

EXPL PERMIT 189, URANERZ EXPL+MNG L, TP118+119 R1W4M, 74M/1+8, ALTA, DRILLING REPT+1MAP BY K LEHNERT-THIEL+B HARMESON+J RICH, ALBERTA RES COUN EC MIN FILE U-AF-118(7), 1977 (CONFIDENTIAL, RELEASE DATE 17 FEB 1983) (701408)

EXPL PERMIT 194, URANERZ EXPL+MNG L, TP113+114 R5+6W4M, 74L/15, ALTA, EXPL SUMMARY REPT BY K LEHNERT-THIEL, ALBERTA RES COUN EC MIN FILE U-AF-122(6), 1975 (CONFIDENTIAL, RELEASE DATE 17 FEB 1983) (701407)

EXPL PERMIT 193, URANERZ EXPL+MNG L, TP114+115 R4+5W4M, 74L/15, ALTA, EXPL SUMMARY REPT BY K LEHNERT-THIEL, ALBERTA RES COUN EC MIN FILE U-AF-121(6), 1975 (CONFIDENTIAL, RELEASE DATE 17 FEB 1983) (701406)

EXPL PERMIT 190, URANERZ EXPL+MNG L, TP117+118 R1+2W4M, 74M/1+8, ALTA, EXPL SUMMARY REPT BY K LEHNERT-THIEL, ALBERTA RES COUN EC MIN FILE U-AF-119(6), 1975 (CONFIDENTIAL, RELEASE DATE 17 FEB 1983) (701405)

EXPL PERMIT 189, URANERZ EXPL+MNG L, TP118+119 R1W4M, 74M/1+8, ALTA, EXPL SUMMARY REPT BY K LEHNERT-THIEL, ALBERTA RES COUN EC MIN FILE U-AF-118(6), 1975 (CONFIDENTIAL, RELEASE DATE 17 FEB 1983) (701404)

EXPL PERMIT 195, URANERZ EXPL+MNG L, TP117+118 R2-4W4M, 74M/1+2+8, ALTA, GEOPHYSICAL ASSESSMENT REPT+4MAPS BY E R ROCKEL, ALBERTA RES COUN EC MIN FILE U-AF-124(1), 1978 (CONFIDENTIAL, RELEASE DATE 17 FEB 1983) (701403)

EXPL PERMIT 192, URANERZ EXPL+MNG L, TP116+117 R3+4W4M, 74M/1+2, ALTA, GEOPHYSICAL ASSESSMENT REPT+4MAPS BY E R ROCKEL, ALBERTA RES COUN EC MIN FILE U-AF-123(1), 1978 (CONFIDENTIAL, RELEASE DATE 17 FEB 1983) (701402)

EXPL PERMIT 193, URANERZ EXPL+MNG L, TP114+115 R4+5W4M, 74L/15, ALTA, GEOPHYSICAL ASSESSMENT REPT+4MAPS BY E R ROCKEL, ALBERTA RES COUN EC MIN FILE U-AF-121(5), 1978 (CONFIDENTIAL, RELEASE DATE 17 FEB 1983) (701401)

EXPL PERMIT 194, URANERZ EXPL+MNG L, TP113+114 R5+6W4M, 74L/15, ALTA, GEOPHYSICAL ASSESSMENT REPT+4MAPS BY E R ROCKEL, ALBERTA RES COUN EC MIN FILE U-AF-122(5), 1978 (CONFIDENTIAL, RELEASE DATE 17 FEB 1983) (701400)

EXPL PERMIT 190, URANERZ EXPL+MNG L, TP117+118 R1+2W4M, 74M/1+8, ALTA, GEOPHYSICAL ASSESSMENT REPT+4MAPS BY E R ROCKEL, ALBERTA RES COUN EC MIN FILE U-AF-119(5), 1978 (CONFIDENTIAL, RELEASE DATE 17 FEB 1983) (701399)

EXPL PERMIT 189, URANERZ EXPL+MNG L, TP118+119 R1W4M, 74M/1+8, ALTA, GEOPHYSICAL ASSESSMENT REPT+4MAPS BY E R ROCKEL, ALBERTA RES COUN EC MIN FILE U-AF-118(5), 1978 (CONFIDENTIAL, RELEASE DATE 17 FEB 1983) (701398)

EXPL PERMIT 194, URANERZ EXPL+MNG L, TP113+114 R5+6W4M, 74L/15, ALTA, SUMMARY REPT BY K LEHNERT-THIEL+B HARMESON+J RICH, ALBERTA RES COUN EC MIN FILE U-AF-122(4), 1978 (CONFIDENTIAL, RELEASE DATE 17 FEB 1983) (701397)

EXPL PERMIT 193, URANERZ EXPL+MNG L, TP114+115 R4+5W4M, 74L/15, ALTA, SUMMARY REPT BY K LEHNERT-THIEL+B HARMESON+J RICH, ALBERTA RES COUN EC MIN FILE U-AF-121(4), 1978 (CONFIDENTIAL, RELEASE DATE 17 FEB 1983) (701396)

EXPL PERMIT 190, URANERZ EXPL+MNG L, TP117-118 R1+2W4M, 74M/1+8, ALTA, SUMMARY REPT BY K LEHNERT-THIEL+J RICH+B HARMESON, ALBERTA RES COUN EC MIN FILE U-AF-119(4), 1978 (CONFIDENTIAL, RELEASE DATE 17 FEB 1983) (701395)

EXPL PERMIT 189, URANERZ EXPL+MNG L, TP118+119 R1W4M, 74M/1+8, ALTA, SUMMARY REPT BY K LEHNERT-THIEL+J RICH+B HARMESON, ALBERTA RES COUN EC MIN FILE U-AF-118(4), 1978 (CONFIDENTIAL, RELEASE DATE 17 FEB 1983) (701394)

EXPL PERMIT 247, AQUARIUS MS L, TP124 R1W4M, 74M/16, ALTA, PROGRESS REPT+1MAP BY J R ALLAN, ALBERTA RES COUN EC MIN FILE U-AF-126(1), 1976 (701336)

EXPL PERMIT 194, URANERZ EXPL+MNG L, TP113+114 R5+6W4M, 74L/15, ALTA, GEOL REPT BY M MACMAHON, ALBERTA RES COUN EC MIN FILE U-AF-122(3), 1977 (CONFIDENTIAL, RELEASE DATE 17 FEB 1983) (700969)

EXPL PERMIT 193, URANERZ EXPL+MNG L, TP114+115 R4+5W4M, 74L/15, ALTA, GEOL REPT BY M MACMAHON, ALBERTA RES COUN EC MIN FILE U-AF-121(3), 1977 (CONFIDENTIAL, RELEASE DATE 17 FEB 1983) (700968)

EXPL PERMIT 190, URANERZ EXPL+MNG L, TP117+118 R1+2W4M, 74M/1+8, ALTA, SUMMARY REPT+2MAPS BY K LEHNERT-THIEL+J RICH+B HARMESON, ALBERTA RES COUNEC MIN FILE U-AF-119(3), 1978 (CONFIDENTIAL, RELEASE DATE 17 FEB 1983) (700966)

EXPL PERMIT 189, URANERZ EXPL+MNG L, TP118+119 R1W4M, 74M/1+8, ALTA, SUMMARY REPT+2MAP BY K LEHNERT-THIEL+J RICH+B HARMESON, ALBERTA RES COUN EC MIN FILE U-AF-118(3), 1978 (CONFIDENTIAL, RELEASE DATE 17 FEB 1983) (700965)

EXPL PERMIT 194, URANERZ EXPL+MNG L, TP113+114 R5+6W4M, 74L/15, ALTA, SUMMARY REPT+3MAPS BY K LEHNERT-THIEL+J RICH+B HARMESON, ALBERTA RES COUN EC MIN FILE U-AF-122(2), 1978 (CONFIDENTIAL, RELEASE DATE 17 FEB 1983) (700964)

EXPL PERMIT 193, URANERZ EXPL+MNG L, TP114+115 R4+5W4M, 74L/15, ALTA, SUMMARY REPT+3MAPS BY K LEHNERT-THIEL+J RICH+B HARMESON, ALBERTA RES COUN EC MIN FILE U-AF-121(2), 1978 (CONFIDENTIAL, RELEASE DATE 17 FEB 1983) (700963)

EXPL PERMIT 191, URANERZ EXPL+MNG L, TP117+118 R2+3W4M, 74M/1+8, ALTA, GEOPHYSICAL REPT+4MAPS BY E R ROCKEL, ALBERTA RES COUN EC MIN FILE U-AF-120(2), 1975 (CONFIDENTIAL, RELEASE DATE 17 FEB 1983) (700962)

EXPL PERMIT 190, URANERZ EXPL+MNG L, TP117+118 R1+2W4M, 74M/1+8, ALTA, SUMMARY REPT+5MAPS BY K LEHNERT-THIEL+J RICH+B HARMESON, ALBERTA RES COUN EC MIN FILE U-AF-119(2), 1978 (CONFIDENTIAL, RELEASE DATE 17 FEB 1983) (700961)

EXPL PERMIT 189, URANERZ EXPL+MNG L, TP118-119 R1W4M, 74M/1+8, ALTA, SUMMARY REPT+5MAPS, BY K LEHNERT-THIEL+J RICH+B HARMESON, ALBERTA RES COUN EC MIN FILE U-AF-118(2), 1978 (CONFIDENTIAL, RELEASE DATE 17 FEB 1983) (700960)

EXPL PERMIT 194, URANERZ EXPL+MNG L, TP113+114 R5+6W4M, 74L/15, ALTA, ANNUAL SUMMARY REPT+29MAPS, BY K LEHNERT-THIEL+W KRETSCHMAR, ALBERTA RES COUN EC MIN FILE U-AF-122(1), 1976 (CONFIDENTIAL, RELEASE DATE 17 FEB 1983) (700912)

EXPL PERMIT 193, URANERZ EXPL+MNG L, TP114+115 R4+5W4M, 74L/15, ALTA, ANNUAL SUMMARY REPORT+4MAPS , BY K LEHNERT-THIEL+W KRETSCHMAR, ALBERTA RES COUN EC MIN FILE U-AF-121(1), 1976 (CONFIDENTIAL, RELEASE DATE 17 FEB 1983) (700911)

EXPL PERMIT 191, URANERZ EXPL+MNG L, TP117+118 R2+3W4M, 74M/1, ALTA, ANNUAL SUMMARY REPORT+4MAPS, BY K LEHNERT-THIEL+W KRETSCHMAR, ALBERTA RES COUN EC MIN FILE U-AF-120(1), 1976 (CONFIDENTIAL, RELEASE DATE 17 FEB 1983) (700910)

EXPL PERMIT 190, URANERZ EXPL+MNG L, TP117+118 R1+2W4M, 74M/1+8, ALTA, ANNUAL SUMMARY REPORT+4MAP S, BY K LEHNERT-THIEL+W KRETSCHMAR, ALBERTA RES COUN EC MIN FILE U-AF-119(1), 1976 (CONFIDENTIAL, RELEASE DATE 17 FEB 1983) (700909)

EXPL PERMIT 189, URANERZ EXPL+MNG L, TP118-119 R1W4M, 74M/1+8, ALTA, ANNUAL SUMMARY REPORT+4MAPS, BY K LEHNERT-THIEL+W KRETSCHMAR, ALBERTA RES COUN EC MIN FILE U-AF-118(1), 1976 (CONFIDENTIAL, RELEASE DATE 17 FEB 1983) (700908)

EXPL PERMIT 187, ELDORADO NUCLEAR L, TP105-107 R5+6W4M, 74L/2+7, ALTA, SUMMARY REPT+30MAPS BY H LAANELA, ALBERTA RES COUN EC MIN FILE U-AF-117(2), 1977 (700906)

EXPL PERMIT 187, ELDORADO NUCLEAR L, TP105-107 R5+6W4M, 74L/2+7, ALTA, GEOL REPT+9MAPS BY M J MOREAU, ALBERTA RES COUN EC MIN FILE U-AF-117(1), 1976 (700905)

EXPL PERMIT 186, ELDORADO NUCLEAR L, TP105-107 R4+5W4M, 74L/2+7, ALTA, SUMMARY REPT+30MAPS BY H LAANELA, ALBERTA RES COUN EC MIN FILE U-AF-116(2), 1977 (700904)

EXPL PERMIT 186, ELDORADO NUCLEAR L, TP105-107 R4+5W4M, 74L/2+7, ALTA, GEOL REPT+9MAPS BY M J MOREAU, ALBERTA RES COUN EC MIN FILE U-AF-116(1), 1976 (700903)

EXPL PERMIT 185, ELDORADO NUCLEAR L, TP104-106 R2-4W4M, 74L/1+2, ALTA, SUMMARY REPT+30MAPS BY H LAANELA, ALBERTA RES COUN EC MIN FILE U-AF-115(2), 1977 (700902)

EXPL PERMIT 185, ELDORADO NUCLEAR L, TP104-106 R2-4W4M, 74L/1+2, ALTA, GEOL REPT+9MAPS BY M J MOREAU, ALBERTA RES COUN EC MIN FILE U-AF-115(1), 1976 (700901)

EXPL PERMIT 184, AQUARIUS MS L, TP124+125 R2W4M, 74M/16, ALTA, SUMMARY PROGRESS REPT BY J R ALLAN, ALBERTA RES COUN EC MIN FILE U-AF-114(4), 1977 (700900)

EXPL PERMIT 184, AQUARIUS MS L, TP124+125 R2W4M, 74M/16, ALTA, SUMMARY PROGRESS REPT BY J R ALLAN, ALBERTA RES COUN EC MIN FILE U-AF-114(3), 1976 (700899)

EXPL PERMIT 184, AQUARIUS MS L, TP124+125 R2W4M, 74M/16, ALTA, GEOL REPT+8MAPS BY J SULLIVAN, ALBERTA RES COUN EC MIN FILE
U-AF-114(2),1974 (700898)

EXPL PERMIT 184, AQUARIUS MS L, TP124+125 R2W4M, 74M/16, ALTA, PROGRESS REPT+2MAPS BY J R ALLAN, ALBERTA RES COUN EC MIN FILE
U-AF-114(1),1976 (700897)

EXPL PERMIT 183, AQUARIUS MS L, TP124-126 R1+2W4M, 74M/16, ALTA, SUMMARY PROGRESS REPT BY J R ALLAN, ALBERTA RES COUN EC MIN FILE
U-AF-113(4),1977 (700896)

EXPL PERMIT 183, AQUARIUS MS L, TP124-126 R1+2W4M, 74M/16, ALTA, SUMMARY PROGRESS REPT BY J R ALLAN, ALBERTA RES COUN EC MIN FILE
U-AF-113(3),1976 (700895)

EXPL PERMIT 183, AQUARIUS MS L, TP124-126 R1+2W4M,74M/16, ALTA, GEOL REPT+8MAPS BY J SULLIVAN , ALBERTA RES COUN EC MIN FILE
U-AF-113(2),1974 (700894)

EXPL PERMIT 183, AQUARIUS MS L, TP124-126 R1+2W4M, 74M/16, ALTA, PROGRESS REPT+2MAPS BY J R ALLAN, ALBERTA RES COUN EC MIN FILE
U-AF-113(1), 1976 (700893)

EXPL PERMIT 182, AQUARIUS MS L, TP123-125 R1+2W4M,74M/9+16, ALTA, SUMMARY PROGRESS REPT BY J R ALLAN, ALBERTA RES COUN EC MIN FILE
U-AF-112(5),1977 (700892)

EXPL PERMIT 182, AQUARIUS MS L, TP123-125 R1+2W4M, 74M/9+16, ALTA, SUMMARY PROGRESS REPT BY J R ALLAN, ALBERTA RES COUN EC MIN FILE
U-AF-112(4),1976 (700891)

EXPL PERMIT 182, AQUARIUS MS L, TP123-125 R1+2W4M,74M/9+16, ALTA, SUMMARY REPT+1MAP BY J R ALLAN, ALBERTA RES COUN EC MIN FILE
U-AF-112(3), 1977 (700890)

EXPL PERMIT 180, INEXCO MNG C, TP103+104 R2+4W4M, 74E/15+16+74L/1+2, ALTA, GEOL REPT+2MAPS BY K THIEL, ALBERTA RES COUN EC MIN FILE
U-AF-110(1),1974 (700886)

EXPL PERMIT 179, INEXCO MNG C, TP101-104 R1+2W4M,74E/16+74L/1, ALTA, GEOL REPT+2MAPS BY K THIEL, ALBERTA RES COUN EC MIN FILE U-AF-109(1), 1974 (700885)

EXPL PERMIT 182, AQUARIUS MS L, TP123-125 R1+2W4M,74M/9+16, ALTA, PROGRESS REPT+2MAPS BY J R ALLAN, ALBERTA RES COUN EC MIN FILE U-AF-112(2),1976 (700889)

EXPL PERMIT 182, AQUARIUS MS L, TP123-125 R1+2W4M, 74M/9+16, ALTA, GEOL REPT+8MAPS BY J SULLIVAN, ALBERTA RES COUN EC MIN FILE 112(1), 1974 (700888)

EXPL PERMIT 181, INEXCO MNG C, TP103-105 R4+5W4M, 74E/15+16+74L/1+2, ALTA, GEOL REPT+2MAPS BY K THIEL, ALBERTA RES COUN EC MIN FILE U-AF-111(1), 1974 (700887)

EXPL PERMIT 175, FRANCES CREEK MS L, TP2-4 R1W5M, 82G/1+8, ALTA, GEOL+STREAM SEDIMENT GEOCHEMISTRY REPT+2MAPS, BY G B ALLEN, ALBERTA RES COUN EC MIN FILE CU-AF-040(1), 1973 (700718)

EXPL PERMIT 175, FRANCES CREEK MS L, TP2-4 R1W5M, 82G/1+8, ALTA, RECONNAISSANCE+GEOCHEMICAL SVY REPT+1MAP, BY G B ALLEN, ALBERTA RES COUN EC MIN FILE CU-AF-040(2), 1975 (700719)

IRON PERMIT 28, IMPERIAL OIL ENTERPRISES L, TP120-122 R21+22W5M, 84N/5+6+11+12, ALTA, GEOL REPT+4MAPS, BY J C UNDERHILL, ALBERTA RES COUN EC MIN FILE FE-AF-028(01), 1964 (700694)

EXPL PERMIT 145, VISION DEV L, TP121+122 R5+6W4M, 74M/10, ALTA, RECONNAISANCE SAMPLING+RADIOMETRIC SVY REPT, BY K A C MACNAIR, ALBERTA RES COUN EC MIN FILE U-AF-099(1), 1970 (700183)

EXPL PERMIT 144, R E ALEXANDER, TP119 R7W4M, 74M/6, ALTA, STREAM SEDIMENT GEOCHEMISTRY REPT+1MAP, BY G V LLOYD+D J TURNER, ALBERTA RES COUN EC MIN FILE U-AF-098(2), 1970 (700182)

EXPL PERMIT 144, R E ALEXANDER, TP119 R7W4M, 74M/6, ALTA, GROUND MAGNETOMETER SVY REPT+1MAP, BY G V LLOYD, ALBERTA RES COUN EC MIN FILE U-AF-098(1), 1970 (700181)

EXPL PERMIT 143, VALDUN DEVS L, TP122+123 R1+2W4M, 74M/9, ALTA, GEOL+GROUND SCINTILLOMETER SVY REPT+3MAPS, BY H H WILLIAMS, ALBERTA RES COUN EC MIN FILE U-AF-097(1), 1970 (700180)

EXPL PERMIT 142, NORTH CANADIAN OILS L, TP113+114 R5+6W4M, 74L/15, ALTA, GROUND SCINTILLOMETER SVY+SURFACE SAMPLING REPT+6MAPS, BY J D HALE, ALBERTA RES COUN EC MIN FILE U-AF-096(1), 1970 (700179)

EXPL PERMIT 139, SLEK INVESTMENTS L, TP122+123 R8+9W4M, 74M/11, ALTA, AIR GAMMA-RAY SPECTROMETER SVY REPT+2MAPS, BY J A GREIG, ALBERTA RES COUN EC MIN FILE U-AF-095(2), 1970 (700178)

EXPL PERMIT 139, SLEK INVESTMENTS L, TP122+123 R8+9W4M, 74M/11, ALTA, PRELIM GEOL+ECONOMIC POTENTIAL REPT+3MAPS, BY A RICH+J A GREIG, ALBERTA RES COUN EC MIN FILE U-AF-095(1), 1969 (700177)

EXPL PERMIT 138, PACCA HOLDINGS L, TP120 R5W4M, 74M/7, ALTA, GEOL+GROUND SCINTILLOMETER SVY REPT, BY C J ANDERSON, ALBERTA RES COUN EC MIN FILE U-AF-094(2), 1970 (700176)

EXPL PERMIT 138, PACCA HOLDINGS L, TP120 R5W4M, 74M/7, ALTA, GEOL+GROUND SCINTILLOMETER SVY REPT+7MAPS, BY K W GEIGER, ALBERTA RES COUN EC MIN FILE U-AF-094(1), 1969 (700175)

EXPL PERMIT 137, SUMMIT OILS L, TP119 R3W4M, 74M/7+8, ALTA, GEOL+GROUND SCINTILLOMETER SVY REPT+8MAPS, BY R K NETOLITZKY, ALBERTA RES COUN EC MIN FILE U-AF-093(2), 1970 (700174)

EXPL PERMIT 137, SUMMIT OILS L, TP119 R3W4M, 74M/7+8, ALTA, AIRBORNE GAMMA-RAY SPECTROMETER SVY REPT, BY GEO-X SVYS L, ALBERTA RES COUN EC MIN FILE U-AF-093(1), 1969 (700173)

EXPL PERMIT 136, F S LIEBER, TP113+114 R7W4M, 74L/14, ALTA, GEOL+GROUND SCINTILLOMETER SVY REPT+1MAP, BY H H WILLIAMS, ALBERTA RES COUN EC MIN FILE U-AF-092(2), 1970 (700172)

EXPL PERMIT 136, F S LIEBER, TP113+114 R7W4M, 74L/14, ALTA, PRELIM GEOL+ECONOMIC POTENTIAL REPT+4MAPS, BY A RICH+J A GREIG, ALBERTA RES COUN EC MIN FILE U-AF-092(1), 1969 (700171)

EXPL PERMIT 135, F S LIEBER, TP114 R5-7W4M, 74L/14+15, ALTA, GEOL+GROUND SCINTILLOMETER SVY REPT+1MAP, BY H H WILLIAMS, ALBERTA RES COUN EC MIN FILE U-AF-091(2), 1970 (700170)

EXPL PERMIT 135, F S LIEBER, TP114 R5-7W4M, 74L/14+15, ALTA, PRELIM GEOL+ECONOMIC POTENTIAL REPT+4MAPS, BY A RICH+J A GREIG, ALBERTA RES COUN EC MIN FILE U-AF-091(1), 1969 (700169)

EXPL PERMIT 134, ANTHONY RICH, TP115+116 R6-8W4M, 74L/14+15 AND 74M/3, ALTA, GEOL+GROUND SCINTILLOMETER SVY REPT+3MAPS, BY R TURNER, ALBERTA RES COUN EC MIN FILE U-AF-090(2), 1969 (700167)

EXPL PERMIT 134, ANTHONY RICH, TP115+116 R6-8W4M, 74L/14+15 AND 74M/3, ALTA, ECONOMIC POTENTIAL+PROPOSED EXPLORATION REPT+2MAPS, BY A RICH+J A GREIG, ALBERTA RES COUN EC MIN FILE U-AF-090(1), 1969 (700166)

EXPL PERMIT 133, ANTHONY RICH, TP116 R4-7W4M, 74M/2+3, ALTA, SUMMARY REPT, BY A RICH, ALBERTA RES COUN EC MIN FILE U-AF-089(6), 1972 (700165)

EXPL PERMIT 133, ANTHONY RICH, TP116 R4-7W4M, 74M/2+3, ALTA, GEOL+GROUND SCINTILLOMETER SVY REPT+5MAPS, BY E A BABCOCK, ALBERTA RES COUN EC MIN FILE U-AF-089(5), 1971 (700164)

EXPL PERMIT 133, ANTHONY RICH, TP116 R4-7W4M, 74M/2+3, ALTA, PROGRESS REPT, BY A RICH+J A GREIG, ALBERTA RES COUN EC MIN FILE U-AF-089(4), 1971 (700163)

EXPL PERMIT 133, ANTHONY RICH, TP116 R4-7W4M, 74M/2+3, ALTA, GEOL+GROUND RADIOMETRIC SVY REPT+2MAPS, BY H H WILLIAMS, ALBERTA RES COUN EC MIN FILE U-AF-089(3), 1970 (700162)

EXPL PERMIT 133, ANTHONY RICH, TP116 R4-7W4M, 74M/2+3, ALTA, PROGRESS REPT, BY A RICH+J A GREIG, ALBERTA RES COUN EC MIN FILE U-AF-089(2), 1970 (700161)

EXPL PERMIT 133, ANTHONY RICH, TP116 R4-7W4M, 74M/2+3W, ALTA, ECONOMIC POTENTIAL+PROPOSED EXPLORATION REPT+2MAPS, BY A RICH+J A GREIG, ALBERTA RES COUN EC MIN FILE U-AF-089(1), 1969 (700160)

EXPL PERMIT 134, ANTHONY RICH, TP115+116 R6-8W4M, 74L/14+15 AND 74M/3, ALTA, PROGRESS REPT, BY A RICH+J A GREIG, ALBERTA RES COUN EC MIN FILE U-AF-090(3), 1970 (700168)

EXPL PERMIT 132, ANTHONY RICH, TP115 R4-6W4M, 74M/15, ALTA, SUMMARY REPT, BY A RICH, ALBERTA RES COUN EC MIN FILE U-AF-088(7), 1972 (700159)

EXPL PERMIT 132, ANTHONY RICH, TP115 R4-6W4M, 74M/15, ALTA, GEOL+GROUND SCINTILLOMETER SVY REPT+5MAPS, BY E A BABCOCK, ALBERTA RES COUN EC MIN FILE U-AF-088(6), 1971 (700158)

EXPL PERMIT 132, ANTHONY RICH, TP115 R4-6W4M, 74M/15, ALTA, PROGRESS REPT, BY A RICH+J A GREIG, ALBERTA RES COUN EC MIN FILE U-AF-088(5), 1971 (700157)

EXPL PERMIT 132, ANTHONY RICH, TP115 R4-6W4M, 74M/15, ALTA, GEOL+GROUND RADIOMETRIC SVY REPT+2MAPS, BY H H WILLIAMS, ALBERTA RES COUN EC MIN FILE U-AF-088(4), 1970 (700156)

EXPL PERMIT 132, ANTHONY RICH, TP115 R4-6W4M, 74M/15, ALTA, GEOL+GROUND SCINTILLOMETER SVY REPT+3MAPS, BY R TURNER, ALBERTA RES COUN EC MIN FILE U-AF-088(2), 1969 (700154)

EXPL PERMIT 132, ANTHONY RICH, TP115 R4-6W4M, 74M/15, ALTA, ECONOMIC POTENTIAL+PROPOSED EXPLORATION REPT+2MAPS, BY A RICH+J A GREIG, ALBERTA RES COUN EC MIN FILE U-AF-088(1), 1969 (700153)

EXPL PERMIT 131, DOLPHIN EXPLS L, TP117-119 R7+8W4M, 74M/3+6, ALTA, GEOL+GROUND SCINTILLOMETER SVY REPT+3MAPS, BY J A GREIG+A RICH, ALBERTA RES COUN EC MIN FILE U-AF-087(2), 1969 (700152)

EXPL PERMIT 131, DOLPHIN EXPLS L, TP117-119 R7+8W4M, 74M/3+6, ALTA, ECONOMIC POTENTIAL+PROPOSED EXPLORATION REPT+1MAP, BY A RICH+J A GREIG, ALBERTA RES COUN EC MIN FILE U-AF-087(1), 1969 (700151)

EXPL PERMIT 130, DOLPHIN EXPLS L, TP117+118 R6+7W4M, 74M/2+3+6+7, ALTA, GEOL+GROUND SCINTILLOMETER SVY REPT+3MAPS, BY J A GREIG+A RICH, ALBERTA RES COUN EC MIN FILE U-AF-086(2), 1969 (700150)

EXPL PERMIT 130, DOLPHIN EXPLS L, TP117+118 R6+7W4M, 74M/2+3+6+7, ALTA, ECONOMIC POTENTIAL+PROPOSED EXPLORATION REPT+1MAP, BY A RICH+ J A GREIG, ALBERTA RES COUN EC MIN FILE U-AF-086(1), 1969 (700149)

EXPL PERMIT 129, DOLPHIN EXPLS L, TP118+119 R5-7W4M, 74M/6+7, ALTA, GEOL+GROUND SCINTILLOMETER SVY REPT+3MAPS, BY J A GREIG+A RICH, ALBERTA RES COUN EC MIN FILE U-AF-085(2), 1969 (700148)

EXPL PERMIT 129, DOLPHIN EXPLS L, TP118+119 R5-7W4M, 74M/6+7, ALTA, ECONOMIC POTENTIAL+PROPOSED EXPLORATION REPT+1MAP, BY A RICH+J A GREIG, ALBERTA RES COUN EC MIN FILE U-AF-085(1), 1969 (700147)

EXPL PERMIT 127, SUMMIT OILS L, TP126 R4W4M, 74M/15, ALTA, RECONNAISSANCE GEOL+RADIOMETRIC SVY REPT+3MAPS, BY JAMES EXPL L, ALBERTA RES COUN EC MIN FILE U-AF-083(2), 1970 (700144)

EXPL PERMIT 127, SUMMIT OILS L, TP126 R4W4M, 74M/15, ALTA, AIRBORNE GAMMA-RAY SPECTROMETER SVY REPT+2MAPS, BY GEO-X SVYS L, ALBERTA RES COUN EC MIN FILE U-AF-083(1), 1969 (700143)

EXPL PERMIT 126, UNITY RES L, TP118 R3+4W4M, 74M/SE, ALTA, GEOL+GROUND SCINTILLOMETER SVY REPT+8MAPS, BY R K NETOLITZKY, ALBERTA RES COUN EC MIN FILE U-AF-082(2), 1970 (700142)

EXPL PERMIT 126, UNITY RES L, TP118 R3+4W4M, 74M/SE, ALTA, AIRBORNE GAMMA-RAY SPECTROMETER SVY REPT, BY GEO-X SVYS L, ALBERTA RES COUN EC MIN FILE U-AF-082(1), 1969 (700141)

EXPL PERMIT 125, UNITY RES L, TP116-118 R3-5W4M, 74M/1+2, ALTA, GEOL+GROUND SCINTILLOMETER SVY REPT+8MAPS, BY R K NETOLITZKY, ALBERTA RES COUN EC MIN FILE U-AF-081(2), 1970 (700140)

EXPL PERMIT 125, UNITY RES L, TP116-118 R3-5W4M, 74M/1+2, ALTA, AIRBORNE GAMMA-RAY SPECTROMETER SVY REPT, BY GEO-X SVYS L, ALBERTA RES COUN EC MIN FILE U-AF-081(1), 1969 (700139)

EXPL PERMIT 124, W F ELLISON, TP113 R7W4M, 74L/14, ALTA, PRELIM GEOL+GEOPHYSICAL SVY REPT+1MAP, AUTHOR UNKNOWN, ALBERTA RES COUN EC MIN FILE U-AF-080(1), 1969 (700138)

EXPL PERMIT 123, A RICH, TP113+114 R6W4M, 74L/15, ALTA, GEOL+GROUND SCINTILLOMETER SVY REPT+1MAP BY H H WILLIAMS, ALBERTA RES COUN EC MIN FILE U-AF-079(1), 1970 (700137)

EXPL PERMIT 122, RED DEER MNRLS L, TP125+126 R3-5W4M, 74M/15+16, ALTA, RECONNAISSANCE GEOL+RADIOMETRIC SVY REPT+3MAPS, BY JAMES EXPL L, ALBERTA RES COUN EC MIN FILE U-AF-078(2), 1970 (700136)

EXPL PERMIT 122, RED DEER MNRLS L, TP125+126 R3-5W4M, 74M/15+16, ALTA, AIRBORNE GAMMA-RAY SPECTROMETER SVY REPT+2MAPS, BY GEO-X SVYS L, ALBERTA RES COUN EC MIN FILE U-AF-078(1), 1969 (700135)

EXPL PERMIT 121, RED DEER MNRLS L, TP126 R2+3W4M, 74M/16, ALTA, RECONNAISSANCE GEOL+RADIOMETRIC SVY REPT+3MAPS, BY JAMES EXPL L, ALBERTA RES COUN EC MIN FILE U-AF-077(2), 1970 (700134)

EXPL PERMIT 121, RED DEER MNRLS L, TP126 R2+3W4M, 74M/16, ALTA, AIRBORNE GAMMA-RAY SPECTROMETER SVY REPT+2MAPS, BY GEO-X SVYS L, ALBERTA RES COUN EC MIN FILE U-AF-077(1), 1969 (700133)

EXPL PERMIT 120, R H KING, TP111 R3W4M, 74L/9, ALTA, PHOTO+DATA INTERPRETATION REPT, BY W B GALLUP, ALBERTA RES COUN EC MIN FILE U-AF-076(1), 1970 (700132)

EXPL PERMIT 118, TRIGG, WOOLLETT+ASSOCS L, TP100-102 R4+5W4M, 74E/10+15, ALTA, AIRBORNE RADIOMETRIC SVY INTERPRETATION REPT, BY N R PATERSON, ALBERTA RES COUN EC MIN FILE U-AF-075(3), 1969 (700131)

EXPL PERMIT 118, TRIGG, WOOLLETT+ASSOCS L, TP100-102 R4+5W4M, 74E/10+15, ALTA, AIRBORNE GAMMA-RAY SPECTROMETER SVY REPT+4MAPS, ALBERTA RES COUN EC MIN FILE U-AF-075(2), 1969 (700130)

EXPL PERMIT 128, DOLPHIN EXPLS L, TP119 R4W4M, 74M/7, ALTA, GEOL+GROUND SCINTILLOMETER SVY REPT+3MAPS, BY J A GREIG+A RICH, ALBERTA RES COUN EC MIN FILE U-AF-084(2), 1969 (700146)

EXPL PERMIT 118, TRIGG, WOOLLETT+ASSOCS L, TP100-102 R4+5W4M, 74E/10+15, ALTA, PROPOSED EXPLORATION REPT+1MAP, BY C M TRIGG, ALBERTA RES COUN EC MIN FILE U-AF-075(1), 1969 (700129)

EXPL PERMIT 117, TRIGG, WOOLLETT+ASSOCS L, TP100-102 R3+4W4M, 74E/NE, ALTA, AIRBORNE RADIOMETRIC SVY INTERPRETATION REPT, BY N R PATERSON, ALBERTA RES COUN EC MIN FILE U-AF-074(3), 1969 (700128)

EXPL PERMIT 117, TRIGG, WOOLLETT+ASSOCS L, TP100-102 R3+4W4M, 74E/NE, ALTA, AIRBORNE GAMMA-RAY SPECTROMETER SVY REPT+4MAPS, ALBERTA RES COUN EC MIN FILE U-AF-074(2), 1969 (700127)

EXPL PERMIT 117, TRIGG, WOOLLETT+ASSOCS L, TP100-102 R3+4W4M, 74E/NE, ALTA, PROPOSED EXPLORATION REPT+1MAP, BY C M TRIGG, ALBERTA RES COUN EC MIN FILE U-AF-074(1), 1969 (700126)

EXPL PERMIT 115, K W GEIGER, TP122+123 R6-8W4M, 74M/11, ALTA, GEOL+GROUND SCINTILLOMETER SVY REPT+4MAPS, BY K W GEIGER, ALBERTA RES COUN EC MIN FILE U-AF-073(1), 1969 (700125)

EXPL PERMIT 114, A WOOD, TP121+122 R03W4M, 74M/9, ALTA, PRELIM GEOL+SCINTILLOMETER SVY REPT+1MAP BY A WOOD, ALBERTA RES COUN EC MIN FILE U-AF-072(1), 1969 (700124)

EXPL PERMIT 113, PACCA HOLDINGS L, TP120 R5+6W4M, 74M/6+7, ALTA, GEOL+GROUND SCINTILLOMETER SVY REPT, BY C J ANDERSON, ALBERTA RES COUN EC MIN FILE U-AF-071(2), 1970 (700123)

EXPL PERMIT 113, PACCA HOLDINGS L, TP120 R5+6W4M, 74M/6+7, ALTA, GEOL+GROUND SCINTILLOMETER SVY REPT+7MAPS, BY K W GEIGER, ALBERTA RES COUN EC MIN FILE U-AF-071(1), 1969 (700122)

EXPL PERMIT 112, ANTHONY RICH, TP123+124 R7+8W4M, 74M/11+14, ALTA, GEOL+ECONOMIC APPRAISAL REPT+4MAPS, BY R D MORTON, ALBERTA RES COUN EC MIN FILE U-AF-069(4), 1970 (700121)

EXPL PERMIT 112, ANTHONY RICH, TP123+124 R7+8W4M, 74M/11+14, ALTA, GEOL+GROUND SCINTILLOMETER SVY REPT+4MAPS, BY E A BABCOCK+G S HARTLEY, ALBERTA RES COUN EC MIN FILE U-AF-070(3), 1971 (700120)

EXPL PERMIT 112, ANTHONY RICH, TP123+124 R7+8W4M, 74M/11+14, ALTA, GEOL+GROUND SCINTILLOMETER SVY REPT+3MAPS, BY H H WILLIAMS, ALBERTA RES COUN EC MIN FILE U-AF-070(2), 1970 (700119)

EXPL PERMIT 128, DOLPHIN EXPLS L, TP 119 R4W4M, 74M/7, ALTA, ECONOMIC POTENTIAL+PROPOSED EXPLORATION REPT+1MAP, BY A RICH+J A GREIG, ALBERTA RES COUN EC MIN FILE U-AF-084(1), 1969 (700145)

EXPL PERMIT 112, ANTHONY RICH, TP123+124 R7+8W4M, 74M/11+14, ALTA, AIRBORNE MAGNETOMETER+GAMMA-RAY SPECTROMETER SVY REPT+1MAP, BY GEO-X SVYS L, ALBERTA RES COUN EC MIN FILE U-AF-070(1), 1969 (700118)

EXPL PERMIT 111, ANTHONY RICH, TP123+124 R6+7W4M, 74M/11+14, ALTA, GEOL+ECONOMIC APPRAISAL REPT+4MAPS, BY R D MORTON, ALBERTA RES COUN EC MIN FILE U-AF-069(4), 1970 (700117)

EXPL PERMIT 111, ANTHONY RICH, TP123+124 R6+7W4M, 74M/11+14, ALTA, GEOL+GROUND SCINTILLOMETER SVY REPT+4MAPS, BY E A BABCOCK+G S HARTLEY, ALBERTA RES COUN EC MIN FILE U-AF-069(3), 1971 (700116)

EXPL PERMIT 111, ANTHONY RICH, TP123+124 R6+7W4M, 74M/11+14, ALTA, AIRBORNE MAGNETOMETER+GAMMA-RAY SPECTROMETER SVY REPT+1MAP, BY GEO-X SVYS L, ALBERTA RES COUN EC MIN FILE U-AF-069(1), 1969 (700114)

EXPL PERMIT 110, LEDO MS L, TP105+106 R5W4M, 74L/2+7, ALTA, PRELIM ECONOMIC APPRAISAL REPT, BY W J BLACKSTOCK, ALBERTA RES COUN EC MIN FILE U-AF-068(1), 1969 (700113)

EXPL PERMIT 109, LEDO MS L, TP102 R1+2W4M, 74E/16, ALTA, PRELIM ECONOMIC APPRAISAL REPT, BY W J BLACKSTOCK, ALBERTA RES COUN EC MIN FILE U-AF-067(1), 1969 (700112)

EXPL PERMIT 108, NORTH CANADIAN OILS L, TP118+119 R8+9W4M, 74M/3+6, ALTA, GROUND SCINTILLOMETER SVY+SURFACE+DRILL HOLE SAMPLING REPT+1MAP, BY J D HALE, ALBERTA RES COUN EC MIN FILE U-AF-066(2) 1970 (700111)

EXPL PERMIT 111, ANTHONY RICH, TP123+124 R6+7W4M, 74M/11+14, ALTA, GEOL REPT+2MAPS, BY H H WILLIAMS, ALBERTA RES COUN EC MIN FILE U-AF-069(2), 1970 (700115)

EXPL PERMIT 108, NORTH CANADIAN OILS L, TP118+119 R8+9W4M, 74M/3+6, ALTA, GEOL+AIR GAMMA-RAY SPECTROMETER SVY REPT+2MAPS, BY J T COOK, ALBERTA RES COUN EC MIN FILE U-AF-066(1), 1969 (700110)

EXPL PERMIT 107, NORTH CANADIAN OILS L, TP116+117 R8+9W4M, 74M/3, ALTA, GROUND SCINTILLOMETER SVY+SURFACE SAMPLING REPT+1MAP, BY J D HALE, ALBERTA RES COUN EC MIN FILE U-AF-065(2), 1970 (700109)

EXPL PERMIT 107, NORTH CANADIAN OILS L, TP116+117 R8+9W4M, 74M/3, ALTA, GEOL+AIR GAMMA-RAY SPECTROMETER SVY REPT+2MAPS, BY J T COOK, ALBERTA RES COUN EC MIN FILE U-AF-065(1), 1969 (700108)

EXPL PERMIT 106, NORTH CANADIAN OILS L, TP114+115 R8W4M, 74L/14+74M/3, ALTA, GEOL+AIR GAMMA-RAY SPECTROMETER SVY REPT+2MAPS, BY J T COOK, ALBERTA RES COUN EC MIN FILE U-AF-064(1), 1969 (700107)

EXPL PERMIT 105, NORTH CANADIAN OILS L, TP113+114 R5+6W4M, 74L/15, ALTA, GROUND SCINTILLOMETER SVY+SURFACE+DRILL HOLE SAMPLING REPT+6MAPS, BY J D HALE, ALBERTA RES COUN EC MIN FILE U-AF-063(2), 1970 (700106)

EXPL PERMIT 105, NORTH CANADIAN OILS L, TP113+114 R5+6W4M, 74L/15, ALTA, GEOL+AIR GAMMA-RAY SPECTROMETER SVY REPT+2MAPS, BY J T COOK, ALBERTA RES COUN EC MIN FILE U-AF-063(1), 1969 (700105)

EXPL PERMIT 104, NORTH CANADIAN OILS L, TP116-118 R1-3W4M, 74M/1+8, ALTA, GROUND SCINTILLOMETER SVY+SURFACE+DRILL HOLE SAMPLING REPT+9MAPS, BY J D HALE, ALBERTA RES COUN EC MIN FILE U-AF-062(2), 1970 (700104)

EXPL PERMIT 104, NORTH CANADIAN OILS L, TP116-118 R1-3W4M, 74M/1+8, ALTA, GEOL+AIR GAMMA-RAY SPECTROMETER SVY REPT+3MAPS, BY J T COOK, ALBERTA RES COUN EC MIN FILE U-AF-062(1), 1969 (700103)

EXPL PERMIT 103, NORTH CANADIAN OILS L, TP114+115 R1+2W4M, 74L/16, ALTA, GEOL+AIR GAMMA-RAY SPECTROMETER SVY REPT+2MAPS, BY J T COOK, ALBERTA RES COUN EC MIN FILE U-AF-061(1), 1969 (700102)

EXPL PERMIT 102, ANCO EXPL L, TP109+110 R5W4M, 74L/7+10, ALTA, AIRBORNE GEOPHYSICAL SVY REPT+1MAP, BY R W STEMP, ALBERTA RES COUN EC MIN FILE U-AF-060(1), 1969 (700101)

EXPL PERMIT 101, ANCO EXPL L, TP107-109 R5W4M, 74L/7, ALTA, AIRBORNE GEOPHYSICAL SVY REPT+2MAPS, BY R W STEMP, ALBERTA RES COUN EC MIN FILE U-AF-059(1), 1969 (700100)

EXPL PERMIT 100, ANCO EXPL L, TP108+109 R4+5W4M, 74L/7+10, ALTA, AIRBORNE GEOPHYSICAL SVY REPT+1MAP, BY R W STEMP, ALBERTA RES COUN EC MIN FILE U-AF-058(1), 1969 (700099)

EXPL PERMIT 99, ANCO EXPL L, TP106+107 R4+5W4M, 74L/2+7, ALTA, AIRBORNE GEOPHYSICAL SVY REPT+1MAP, BY R W STEMP, ALBERTA RES COUN EC MIN FILE U-AF-057(1), 1969 (700098)

EXPL PERMIT 98, ANCO EXPL L, TP105 R3-5W4M, 74L/1+2, ALTA, AIRBORNE GEOPHYSICAL SVY REPT+1MAP, BY R W STEMP, ALBERTA RES COUN EC MIN FILE U-AF-056(1), 1969 (700097)

EXPL PERMIT 97, ANCO EXPL L, TP106+107 R2+3W4M, 74L/1+8, ALTA, AIRBORNE GEOPHYSICAL SVY REPT+1MAP, BY R W STEMP, ALBERTA RES COUN EC MIN FILE U-AF-055(1), 1969 (700096)

EXPL PERMIT 96, ANCO EXPL L, TP 105+106 R2+3W4M, 74L/1, ALTA, AIRBORNE GEOPHYSICAL SVY REPT+2MAPS, BY R W STEMP, ALBERTA RES COUN EC MIN FILE U-AF-054(1), 1969 (700095)

EXPL PERMIT 95, ANCO EXPL L, TP103+104 R2+3W4M, 74E/16+74L/1, ALTA, AIRBORNE GEOPHYSICAL SVY REPT+1MAP, BY R W STEMP, ALBERTA RES COUN EC MIN FILE U-AF-053(1), 1969 (700094)

EXPL PERMIT 94, ANCO EXPL L, TP103-105 R1+2W4M, 74E/16+74L/1, ALTA, AIRBORNE GEOPHYSICAL SVY REPT+1MAP, BY R W STEMP, ALBERTA RES COUN EC MIN FILE U-AF-052(1), 1969 (700093)

EXPL PERMIT 93, ANCO EXPL L, TP102+103 R1+2W4M, 74E/16, ALTA, AIRBORNE GEOPHYSICAL SVY REPT+1MAP BY R W STEMP, ALBERTA RES COUN EC MIN FILE U-AF-051(1), 1969 (700092)

EXPL PERMIT 92, ABIDONNE OILS L, TP108+109 R3W4M, 74L/8, ALTA, AIR RADIOMETRIC SVY FLIGHT LOGS, BY NORTHLAND MANAGEMENT+ENG L, ALBERTA RES COUN EC MIN FILE U-AF-050(1), 1969 (700091)

EXPL PERMIT 91, ABIDONNE OILS L, TP107+108 R3W4M, 74L/8, ALTA, AIR RADIOMETRIC SVY FLIGHT LOGS, BY NORTHLAND MANAGEMENT+ENG L, ALBERTA RES COUN EC MIN FILE U-AF-049(1), 1969 (700090)

EXPL PERMIT 89, CANADA SOUTHERN PETROLEUM L, TP105-107 R1W4M, 74L/1+8, ALTA, AIRBORNE SCINTILLOMETER SVY REPT+2MAPS, BY GEOPHOTO SERVS L, ALBERTA RES COUN EC MIN FILE U-AF-047(2), 1969 (700088)

EXPL PERMIT 89, CANADA SOUTHERN PETROLEUM L, TP105-107 R1W4M, 74L/1+8, ALTA, PHOTOGEOLOGIC MAPPING REPT+1MAP, BY GEOPHOTO SERVS L, ALBERTA RES COUN EC MIN FILE U-AF-047(1), 1969 (700087)

EXPL PERMIT 88, MCINTYRE PORCUPINE MS L, TP109+110 R4+5W4M, 74L/10, ALTA, ASSAY REPT, BY X-RAY ASSAY LABORATORIES L, ALBERTA RES COUN EC MIN FILE U-AF-046(2), 1969 (700086)

EXPL PERMIT 88, MCINTYRE PORCUPINE MS L, TP109+110 R4+5W4M, 74L/10, ALTA, AIRBORNE MAGNETOMETER+GAMMA-RAY SPECTROMETER SVY REPT+3MAPS, BY GEO-X SVYS L, ALBERTA RES COUN EC MIN FILE U-AF-046(1) , 1969 (700085)

EXPL PERMIT 87, MCINTYRE PORCUPINE MS L, TP109-111 R3W4M, 74L/9+10, ALTA, AIRBORNE MAGNETOMETER+GAMMA-RAY SPECTROMETER SVY REPT+3MAPS, BY GEO-X SVYS L, ALBERTA RES COUN EC MIN FILE U-AF-045(1) , 1969 (700083)

EXPL PERMIT 85, NATIONAL NICKEL L, TP110-112 R1W4M, 74L/9+16, ALTA, AIRBORNE SCINTILLOMETER SVY+HEAVY METAL GEOCHEMICAL SVY REPT+1MAP, BY E MEYERS+P PAULSON, ALBERTA RES COUN EC MIN FILE U-AF-044(4), 1970 (700082)

EXPL PERMIT 85, NATIONAL NICKEL L, TP110-112 R1W4M, 74L/9+16, ALTA, AIRBORNE GAMMA-RAY SPECTROMETER SVY REPT+4MAPS, BY GEO-X SVYS L, ALBERTA RES COUN EC MIN FILE U-AF-044(3), 1969 (700081)

EXPL PERMIT 85, NATIONAL NICKEL L, TP110-111 R1W4M, 74L/9+16, ALTA, PHOTOGEOLOGIC EVALUATION REPT, BY G M COLLINS, ALBERTA RES COUN EC MIN FILE U-AF-044(2), 1969 (700080)

EXPL PERMIT 85, NATIONAL NICKEL L, TP110-112 R1W4M, 74L/9+16, ALTA, AEROMAGNETIC DATA INTERPRETATION REPT, BY R G AGARWAL, ALBERTA RES COUN EC MIN FILE U-AF-044(1), 1969 (700079)

EXPL PERMIT 84, NATIONAL NICKEL L, TP109+110 R1+2W4M, 74L/9, ALTA, AIRBORNE SCINTILLOMETER SVY+HEAVY METAL GEOCHEMICAL SVY REPT+1MAP, BY E MEYERS+P PAULSON, ALBERTA RES COUN EC MIN FILE U-AF-043(4), 1970 (700078)

EXPL PERMIT 87, MCINTYRE PORCUPINE MS L, TP109+110 R4+5W4M, 74L/9+10, ALTA, ASSAY REPT, BY X-RAY ASSAY LABORATORIES L, ALBERTA RES COUN EC MIN FILE U-AF-045(2), 1969 (700084)

EXPL PERMIT 84, NATIONAL NICKEL L, TP109+110 R1+2W4M, 74L/9, ALTA, PHOTOGEOLOGIC EVALUATION REPT BY G M COLLINS, ALBERTA RES COUN EC MIN FILE U-AF-043(2), 1969 (700076)

EXPL PERMIT 84, NATIONAL NICKEL L, TP109+110 R1+2W4M, 74L/9, ALTA, AEROMAGNETIC DATA INTERPRETATION REPT, BY R G AGARWAL, ALBERTA RES COUN EC MIN FILE U-AF-043(1), 1969 (700075)

EXPL PERMIT 83, NATIONAL NICKEL L, TP108+109 R1+2W4M, 74L/8, ALTA, AIRBORNE SCINTILLOMETER SVY+HEAVY METAL GEOCHEMICAL SVY REPT+1MAP, BY E MEYERS+P PAULSON, ALBERTA RES COUN EC MIN FILE U-AF-042(4), 1970 (700074)

EXPL PERMIT 84, NATIONAL NICKEL L, TP109+110 R1+2W4M, 74L/9, ALTA, AIRBORNE GAMMA-RAY SPECTROMETER SVY REPT+4MAPS, BY GEO-X SVYS L, ALBERTA RES COUN EC MIN FILE U-AF-043(3), 1969 (700077)

EXPL PERMIT 83, NATIONAL NICKEL L, TP108+109 R1+2W4M, 74L/8, ALTA, AIRBORNE GAMMA-RAY SPECTROMETER SVY REPT+4MAPS, BY GEO-X SVYS L, ALBERTA RES COUN EC MIN FILE U-AF-042(3), 1969 (700073)

EXPL PERMIT 83, NATIONAL NICKEL L, TP108+109 R1+2W4M, 74L/8, ALTA, PHOTOGEOLOGIC EVALUATION REPT BY G M COLLINS, ALBERTA RES COUN EC MIN FILE U-AF-042(2), 1969 (700072)

EXPL PERMIT 83, NATIONAL NICKEL L, TP108+109 R1+2W4M, 74L/8, ALTA, AEROMAGNETIC DATA INTERPRETATION REPT, BY R G AGARWAL, ALBERTA RES COUN EC MIN FILE U-AF-041(1), 1969 (700071)

EXPL PERMIT 146, FIESTA OIL+GAS L, TP120+121 R8W4M, 74M/6, ALTA, EXPLORATION SUMMARY REPT, BY D J TURNER, ALBERTA RES COUN EC MIN FILE U-AF-100(2), 1970 (700185)

EXPL PERMIT 82, NATIONAL NICKEL L, TP107+108 R1+2W4M, 74L/8, ALTA, AIRBORNE SCINTILLOMETER SVY+ HEAVY METAL GEOCHEMICAL SVY REPT+1MAP,

BY E MEYERS+P PAULSON, ALBERTA RES COUN EC MIN FILE U-AF-041(4), 1970 (700070)

EXPL PERMIT 82, NATIONAL NICKEL L, TP107+108 R1+2W4M, 74L/8, ALTA, AIRBORNE GAMMA-RAY SPECTROMETER SVY REPT+4MAPS, BY GEO-X SVYS L, ALBERTA RES COUN EC MIN FILE U-AF-041(3), 1969 (700069)

EXPL PERMIT 82, NATIONAL NICKEL L, TP107+108 R1+2W4M, 74L/8, ALTA, PHOTOGEOLOGIC EVALUATION REPT BY G M COLLINS, ALBERTA RES COUN EC MIN FILE U-AF-041(2), 1969 (700068)

EXPL PERMIT 82, NATIONAL NICKEL L, TP107+108 R1+2W4M, 74L/8, ALTA, AEROMAGNETIC DATA INTERPRETATION REPT, BY R G AGARWAL, ALBERTA RES COUN EC MIN FILE U-AF-041(1), 1969 (700067)

EXPL PERMIT 81, CITIZENS PIPELINE L, TP125+126 R7+8W4M, 74M/14, ALTA, GEOL+AIR SCINTILLOMETER SVY REPT, BY J R GLASS, ALBERTA RES COUN EC MIN FILE U-AF-040(2), 1969 (700066)

EXPL PERMIT 81, CITIZENS PIPELINE L, TP125+126 R7+8W4M, 74M/14, ALTA, AIRBORNE GAMMA-RAY SPECTROMETER SVY REPT+1MAP, BY J T COOK, ALBERTA RES COUN EC MIN FILE U-AF-040(1) (700065)

EXPL PERMIT 80, CITIZENS PIPELINE L, TP126 R6+7W4M, 74M/14+15, ALTA, AIRBORNE GAMMA-RAY SPECTROMETER SVY REPT+1MAP, BY J T COOK, ALBERTA RES COUN EC MIN FILE U-AF-039(1), 1969 (700064)

EXPL PERMIT 79, CITIZENS PIPELINE L, TP117-119 R4+5W4M, 74M/2+7, ALTA, AIRBORNE GAMMA-RAY SPECTROMETER SVY REPT+1MAP, BY J T COOK, ALBERTA RES COUN EC MIN FILE U-AF-038(1), 1969 (700063)

EXPL PERMIT 78, CITIZENS PIPELINE L, TP123-125 R4W4M, 74M/10+15, ALTA, AIRBORNE GAMMA-RAY SPECTROMETER SVY REPT+1MAP, BY J T COOK, ALBERTA RES COUN EC MIN FILE U-AF-037(2), 1969 (700062)

EXPL PERMIT 78, CITIZENS PIPELINE L, TP123-125 R4W4M, 74M/10+15, ALTA, GEOL+AIR SCINTILLOMETER SVY REPT, BY J R GLASS, ALBERTA RES COUN EC MIN FILE U-AF-037(1), 1969 (700061)

EXPL PERMIT 77, CITIZENS PIPELINE L, TP118+119 R2+3W4M, 74M/1+8, ALTA, GEOL+AIR SCINTILLOMETER SVY REPT, BY J R GLASS, ALBERTA RES COUN EC MIN FILE U-AF-036(2), 1969 (700060)

EXPL PERMIT 77, CITIZENS PIPELINE L, TP118+119 R2+3W4M, 74M/1+8, ALTA, AIRBORNE GAMMA-RAY SPECTROMETER SVY REPT+1MAP, BY J T COOK, ALBERTA RES COUN EC MIN FILE U-AF-036(1), 1969 (700059)

EXPL PERMIT 74, ENSIGN OILS L, TP111+112 R2W4M, 74L/9+16, ALTA, GEOL REPT+2MAPS, BY P E HIRST, ALBERTA RES COUN EC MIN FILE U-AF-033(2), 1969 (700056)

EXPL PERMIT 73, PACIFIC SILVER MINES+OILS L, TP113 R1-3W4M, 74L/16, ALTA, AIRBORNE SCINTILLOMETER+GROUND RADIOMETRIC SVY REPT+4MAPS, BY A G MACKENZIE, ALBERTA RES COUN EC MIN FILE U-AF-032(3), 1969 (700054)

EXPL PERMIT 73, PACIFIC SILVER MINES+OILS L, TP113 R1-3W4M, 74L/16, ALTA, GROUND SCINTILLOMETER SVY REPT+2MAPS, BY A G MACKENZIE, ALBERTA RES COUN EC MIN FILE U-AF-032(2), 1970 (700053)

EXPL PERMIT 73, PACIFIC SILVER MINES+OILS L, TP113 R1-3W4M, 74L/16, ALTA, MAGNETOMETER+SCINTILLOMETER SVY REPT+3MAPS, BY A G MACKENZIE+R G AGARWAL, ALBERTA RES COUN EC MIN FILE U-AF-032(1), 1972 (700052)

EXPL PERMIT 74, ENSIGN OILS L, TP111+112 R2W4M, 74L/9+16, ALTA, AIRBORNE RADIOMETRIC SVY REPT+4MAPS, BY D SUTTON+J CERNE+N DOWDS, ALBERTA RES COUN EC MIN FILE U-AF-033(1), 1969 (700055)

EXPL PERMIT 69, R H KING, TP111 R04W4M, 74L/10, ALTA, AIRBORNE MAGNETIC+RADIOMETRIC SVY REPT+3MAPS, BY D SUTTON+J CERNE+N DOWDS, ALBERTA RES COUN EC MIN FILE U-AF-031(2), 1969 (700051)

EXPL PERMIT 69, R H KING, TP111 R04W4M, 74L/10, ALTA, GEOL REPT+2MAPS, BY W B GALLUP, ALBERTA RES COUN EC MIN FILE U-AF-031(1), 1969 (700050)

EXPL PERMIT 61, DYNALTA OIL+GAS C L, TP125+126 R5+6W4M, 74M/15, ALTA, RADIOMETRIC SVY REPT+1MAP, BY R M P JONES, ALBERTA RES COUN EC MIN FILE U-AF-030(1), 1969 (700049)

EXPL PERMIT 60, K S NEWBORN, TP126 R6+7W4M, 74M/14, ALTA, AIRBORNE GAMMA-RAY SPECTROMETER SVY REPT+1MAP, BY J T COOK, ALBERTA RES COUN EC MIN FILE U-AF-029(1), 1969 (700048)

EXPL PERMIT 57,CITIZENS PIPELINE L, TP124+125 R6+7W4M, 74M/14, ALTA, AIRBORNE GAMMA-RAY SPECTROMETER SVY REPT+1MAP, BY J T COOK, ALBERTA RES COUN EC MIN FILE U-AF-028(2), 1969 (700047)

EXPL PERMIT 57, J W WOROBEC, TP124+125 R6+7W4M, 74M/14, ALTA, PRELIM GEOL REPT, BY R O MCKENZIE, ALBERTA RES COUN EC MIN FILE U-AF-028(1), 1969 (700046)

EXPL PERMIT 56, J W WOROBEC, TP120 R1+2W4M, 74M/8, ALTA, PRELIM GEOL REPT, BY R O MCKENZIE, ALBERTA RES COUN EC MIN FILE U-AF-027(1), 1969 (700045)

EXPL PERMIT 55, J W WOROBEC, TP118+119 R1+2W4M, 74M/8, ALTA, PRELIM GEOL REPT, BY R O MCKENZIE, ALBERTA RES COUN EC MIN FILE U-AF-026(1), 1969 (700044)

EXPL PERMIT 54, MADISON OILS L, TP119 R4W4M, 74M/7, ALTA, GEOL+SCINTILLOMETER SVY REPT+1MAP, BY J W WOROBEC+R O MCKENZIE, ALBERTA RES COUN EC MIN FILE U-AF-025(1), 1968 (700043)

EXPL PERMIT 52, VISION DEV L, TP119+120 R1-3W4M, 74M/8, ALTA, GEOL REPT+4MAPS, BY J A DOCKERY, ALBERTA RES COUN EC MIN FILE U-AF-024(1), 1968 (700042)

EXPL PERMIT 50, E R GAYFER, TP124+125 R7+8W4M, 74M/14, ALTA, RADIOMETRIC SVY REPT+1 MAP, BY E R GAYFER, ALBERTA RES COUN EC MIN FILE U-AF-023(1), 1968 (700041)

EXPL PERMIT 49, E R GAYFER, TP120+121 R2+3W4M, 74M/8+9, ALTA, RADIOMETRIC SVY REPT+1 MAP, BY E R SMITH, ALBERTA RES COUN EC MIN FILE U-AF-022(1), 1968 (700039)

EXPL PERMIT 48, VISION DEV L, TP122+123 R8+9W4M, 74M/11, ALTA, GEOL REPT+4MAPS, BY J A DOCKERY, ALBERTA RES COUN EC MIN FILE U-AF-021(1), 1968 (700038)

EXPL PERMIT 47, VISION DEV L, TP120 R4+5W4M, 74M/7, ALTA, GEOL REPT+4MAPS, BY J A DOCKERY, ALBERTA RES COUN EC MIN FILE U-AF-020(1), 1968 (700037)

EXPL PERMIT 45, MCMAHON OILS L, TP117 R4+5W4M, 74M/2, ALTA, AIR RADIOMETRIC+GROUND SCINTILLOMETER SVY REPT, BY J D MASON, ALBERTA RES COUN EC MIN FILE U-AF-019(2), 1969 (700036)

EXPL PERMIT 44, ATHABASCA EXPL+MNG L, TP117+118 R2+3W4M, 74M/1, ALTA, EXPLORATION PROGRAM REPT+1MAP, BY R W WESTBURY, ALBERTA RES COUN EC MIN FILE U-AF-018(2), 1969 (700034)

EXPL PERMIT 44, ATHABASCA EXPL+MNG L, TP117+118 R2+3W4M, 74M/1, ALTA, RECONNAISSANCE REPT+1MAP, BY C D WOODHEAD, ALBERTA RES COUN EC MIN FILE U-AF-018(1), 1968 (700033)

EXPL PERMIT 43, MCMAHON OILS L, TP122+123 R3+4W4M, 74M/9+10, ALTA, AIR RADIOMETRIC+GROUND SCINTILLOMETER SVY REPT, BY J D MASON, ALBERTA RES COUN EC MIN FILE U-AF-017(2), 1969 (700032)

EXPL PERMIT 43, MCMAHON OILS L, TP122+123 R3+4W4M, 74M/9+10, ALTA, GEOL REPT+4MAPS, ALBERTA RES COUN EC MIN FILE U-AF-017(1), 1968 (700031)

EXPL PERMIT 132, ANTHONY RICH, TP115 R4-6W4M, 74M/15, ALTA, PROGRESS REPORT, BY A RICH+J A GREIG ALBERTA RES COUN EC MIN FILE U-AF-088(3), 1970 (700155)

EXPL PERMIT 42, VISION DEV L, TP120-122 R3+4W4M, 74M/7+8+9+10, ALTA, GEOL REPT+4MAPS, BY J A DOCKERY, ALBERTA RES COUN EC MIN FILE U-AF-016(2), 1968 (700030)

EXPL PERMIT 42, VISION DEV L, TP120-122 R3+4W4M, 74M/7+8+9+10, ALTA, GEOL+SCINTILLOMETER SVY REPT, BY C D WOODHEAD+C B DIBBLEE, ALBERTA RES COUN EC MIN FILE U-AF-016(1), 1968 (700029)

EXPL PERMIT 41, VISION DEV L, TP119+120 R3+4W4M, 74M/7+8, ALTA, GEOL REPT+4MAPS, BY J A DOCKERY, ALBERTA RES COUN EC MIN FILE U-AF-015(2), 1968 (700028)

EXPL PERMIT 41, VISION DEV L, TP119+120 R3+4W4M, 74M/7+8, ALTA, GEOL+SCINTILLOMETER SVY REPT, BY C D WOODHEAD+C B DIBBLEE, ALBERTA RES COUN EC MIN FILE U-AF-015(1), 1968 (700027)

EXPL PERMIT 40, ALEXANDRA PETROLEUMS L, TP122+123 R3W4M, 74M/9, ALTA, RECONNAISANCE GROUND SCINTILLOMETER SVY REPT+1MAP, BY OSCO ENGINEERING L, ALBERTA RES COUN EC MIN FILE U-AF-014(1), 1968 (700026)

EXPL PERMIT 39, MADISON OILS L, TP119 R3W4M, 74M/8, ALTA, GEOL+SCINTILLOMETER SVY REPT+1MAP, BY J W WOROBEC+R O MCKENZIE, ALBERTA RES COUN EC MIN FILE U-AF-013(1), 1968 (700025)

EXPL PERMIT 36, DYNALTA OIL+GAS C L, TP125+126 R2-5W4M, 74M/15+16, ALTA, AIR RADIOMETRIC SVY REPT+1MAP, BY R M P JONES, ALBERTA RES COUN EC MIN FILE U-AF-012(1), 1968 (700024)

EXPL PERMIT 49, E R GAYFER, TP120+121 R2+3W4M, 74M/8+9, ALTA, EXPLORATION SUMMARY REPT, BY E R GAYFER, ALBERTA RES COUN EC MIN FILE U-AF-022(2), 1968 (700040)

EXPL PERMIT 34, CHIEFTAIN DEV C L, TP122-124 R7+8W4M, 74M/11+14, ALTA, GEOL REPT BY S A MILNER, ALBERTA RES COUN EC MIN FILE U-AF-011(1), 1967 (700023)

EXPL PERMIT 45, MCMAHON OILS L, TP117 R4+5W4M, 74M/2, ALTA, PRELIM GEOL REPT+4MAPS, BY J W WOROBEC, ALBERTA RES COUN EC MIN FILE U-AF-019(1), 1968 (700035)

EXPL PERMIT 31, RADEX MNRLS L, TP123+124 R2+3W4M, 74M/NE, ALTA, GEOL+GROUND RADIOMETRIC SVY REPT+4MAPS, BY R A OLSON, ALBERTA RES COUN EC MIN FILE U-AF-008(4) (700020)

EXPL PERMIT 31, RADEX MNRLS L, TP123+124 R2+3W4M, 74M/NE, ALTA, AIR RADIOMETRIC SVY REPT+1MAP, BY E LIPSETT, ALBERTA RES COUN EC MIN FILE U-AF-008(3), 1969 (700019)

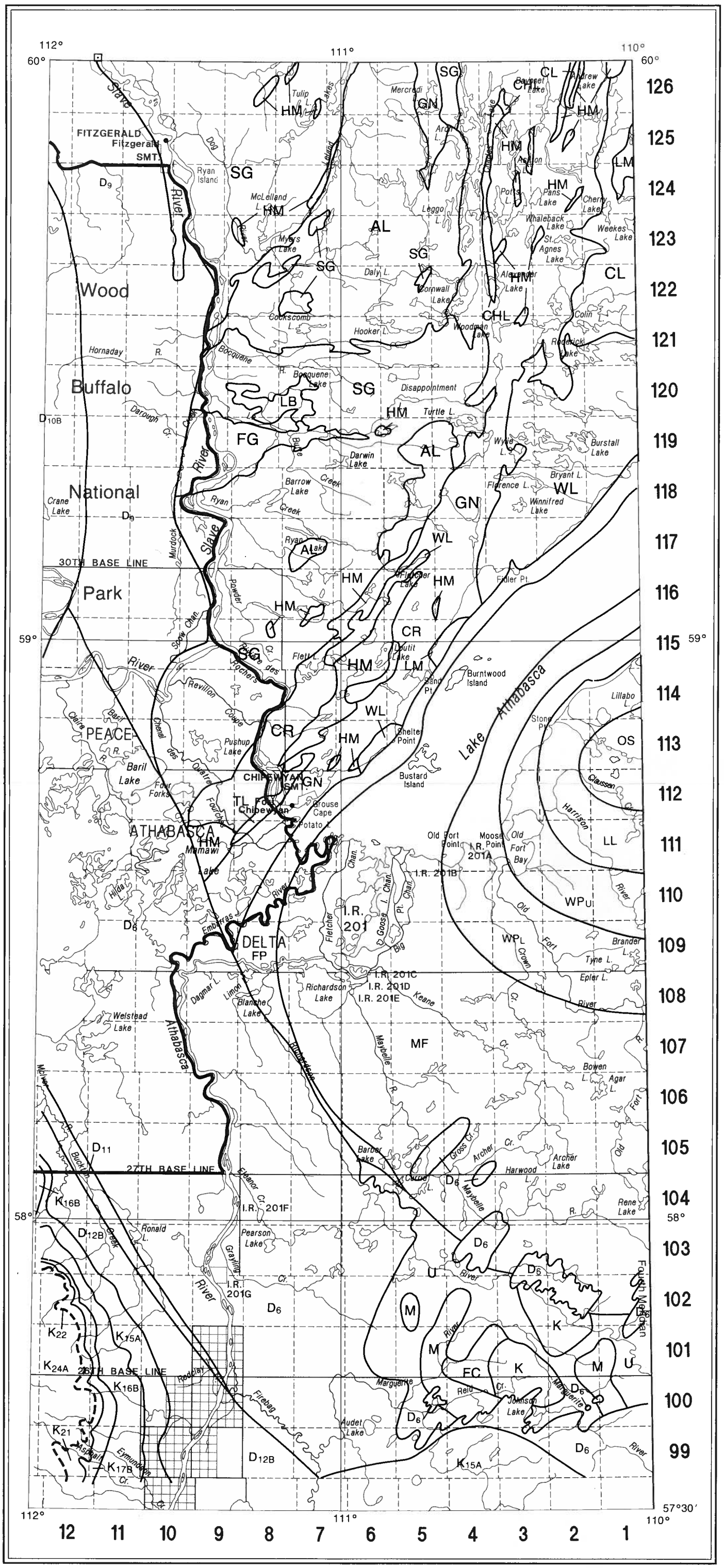
EXPL PERMIT 31, RADEX MNRLS L, TP123+124 R2+3W4M, 74M/NE, ALTA, WATER GEOCHEMICAL SVY REPT+1MAP, BY F D FORGERON, ALBERTA RES COUN EC MIN FILE U-AF-008(2), 1969 (700018)

EXPL PERMIT 26, HUDSON'S BAY OIL+GAS C L, TP124+125 R2+3W4M, 74M/16, ALTA, GEOL+GEOPHYSICAL SVY REPT+14MAPS, BY E C BURGAN, D W POLLACK, D C MITCHELL, ALBERTA RES COUN EC MIN FILE U-AF-005(2), 1971 (700014)

EXPL PERMIT 25, HUDSON'S BAY OIL+GAS C L, TP125+126 R1-3W4M, 74M/16, ALTA, GEOL+GEOPHYSICAL SVY REPT+14MAPS, BY E C BURGAN, D W POLLACK, D C MITCHELL, ALBERTA RES COUN EC MIN FILE U-AF-004(2), 1971 (700012)

EXPL PERMIT 31, LEDO MS L, TP123+124 R2+3W4M, 74M/NE, ALTA, PRELIM GEOL REPT+1MAP, BY O BAYKAL, ALBERTA RES COUN EC MIN FILE U-AF-008(1), 1969 (700017)

EXPL PERMIT 24, HUDSON'S BAY OIL+GAS C L, TP123-126 R1W4M, 74M/9+16, ALTA, GEOL+GEOPHYSICAL SVY REPT+14MAPS, BY E C BURGAN, D W POLLACK, D C MITCHELL, ALBERTA RES COUN EC MIN FILE U-AF-003(2), 1971 (700010)



CRETACEOUS

- K_{24A} Smoky Group
- K_{22} Dunvegan Formation
- K_{21} Shaftesbury Formation
- K_{17B} Alice Creek Tongue, Grand Rapids Formation
- K_{16B} Clearwater Formation
- K_{15A} McMurray Formation

DEVONIAN

- D_{12B} Waterways Formation
- D_{11} Caribou Member, Slave Point Formation
- D_{10B} Muskeg Formation
- D_9 Keg River Formation
- D_6 Undivided Middle Devonian

HELIKIAN

- OS Otherside Formation
- LL Locker Lake Formation
- WP_U / WP_L Upper / Lower Wolverine Point Formation
- MF Manitou Falls Formation
- FP Fair Point Formation

APHEBIAN

- LM Low-Grade Metasedimentary Rocks
- AL Arch Lake Granitoids
- FG Francis Granite
- CR Chipewyan Red Granite
- LB La Butte Granodiorite
- WL Wylie Lake Granitoids
- CL Colin Lake Granitoids
- TL Thesis Lake Granite
- SG Slave Granitoids

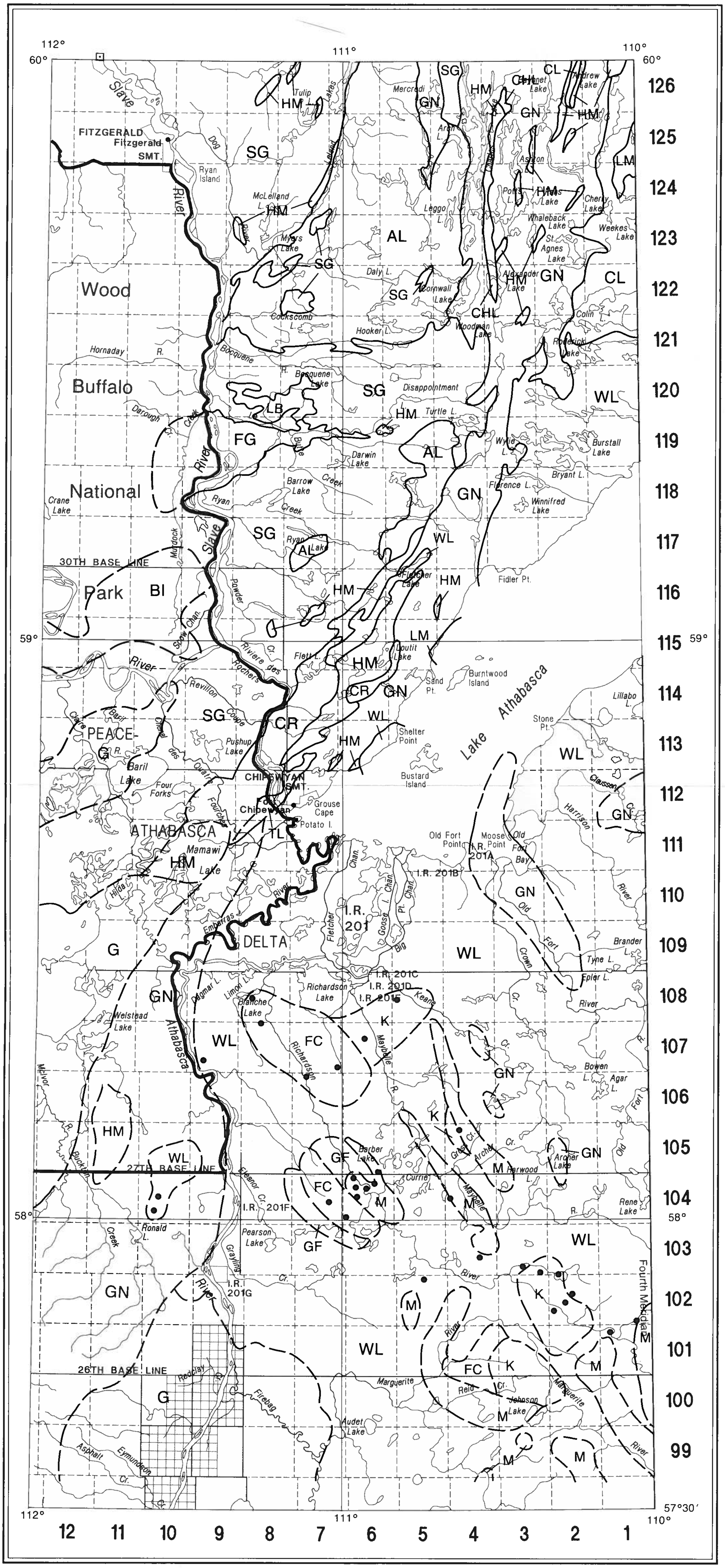
ARCHEAN

- CHL Charles Lake Granitoids
- HM High-Grade Metasedimentary Rocks
- GN Granite Gneisses

APHEBIAN/ARCHEAN

- FC Fishing Creek Granitoid
- M Mylonitic Rocks
- K Alkali Feldspar-rich Granitoid
- GF Grey Foliated Granitoid
- U Undifferentiated

Figure 2. Geological map (simplified from Wilson, 1985 and Godfrey, 1986).



APHEBIAN

LM	Low grade Metasedimentary Rocks
AL	Arch Lake Granitoids
FG	Francis Granite
CR	Chipewyan Red Granite
LB	La Butte Granodiorite
WL	Wylie Lake Granitoids
CL	Colin Lake Granitoids
TL	Thesis Lake Granite
SG	Slave Granitoids

ARCHEAN

CHL	Charles Lake Granitoids
HM	High grade Metasedimentary Rocks
GN	Granite Gneisses

APHEBIAN/ARCHEAN

FC	Fishing Creek Granitoid
M	Mylonitic Rocks
K	Alkali Feldspar rich Granitoid
GF	Grey Foliated Granitoid
G	Undifferentiated Granitoids
BI	Basic Intrusion

——— Geologic boundary mapped

— — — Geologic boundary interpreted from magnetic data

● Location of exploration drill holes used to establish basement rock types

0 20 40 km

0 10 20 30 miles

Figure 3. Basement geology (simplified from Godfrey, 1986 and Wilson, 1986).

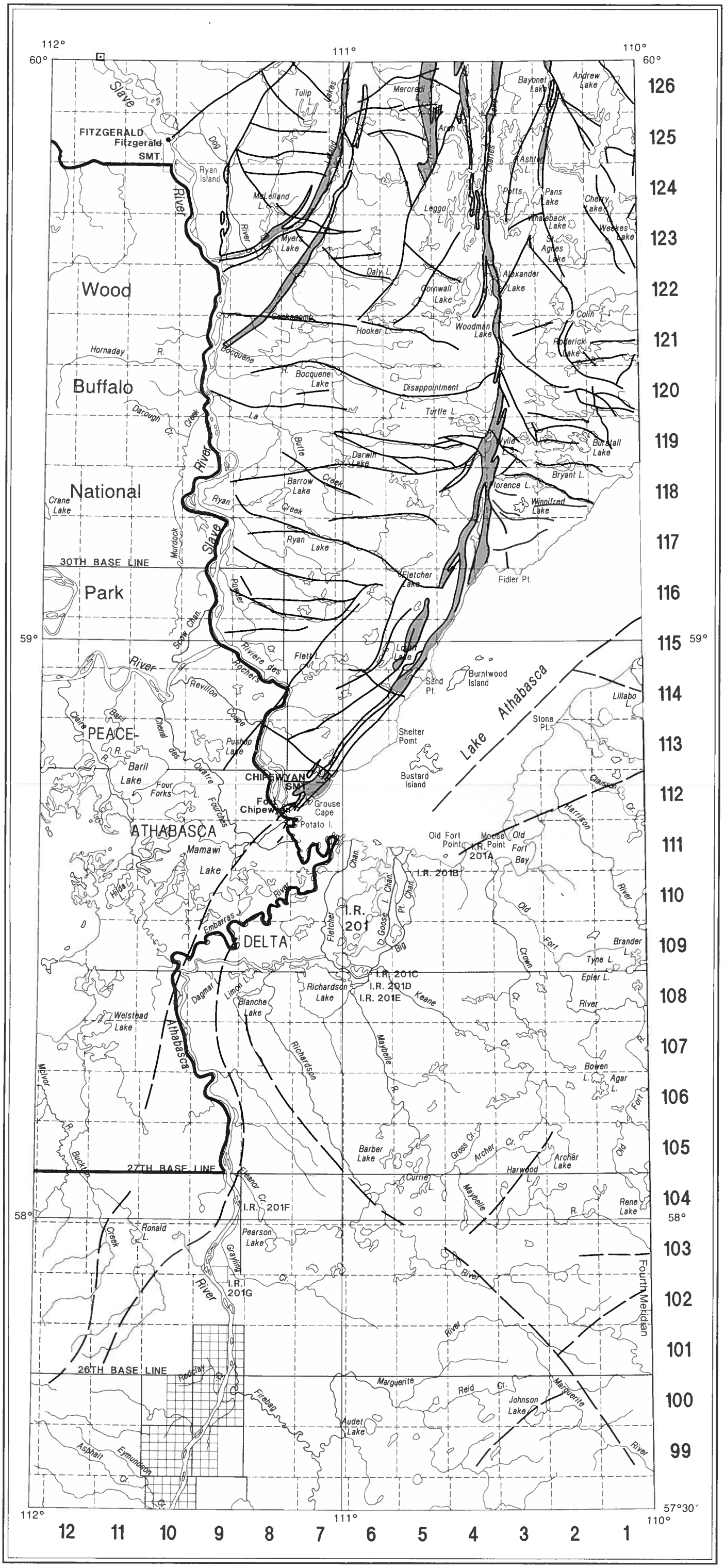


Figure 4. Structural geological map (simplified from Langenberg, 1983 and Wilson, 1985).

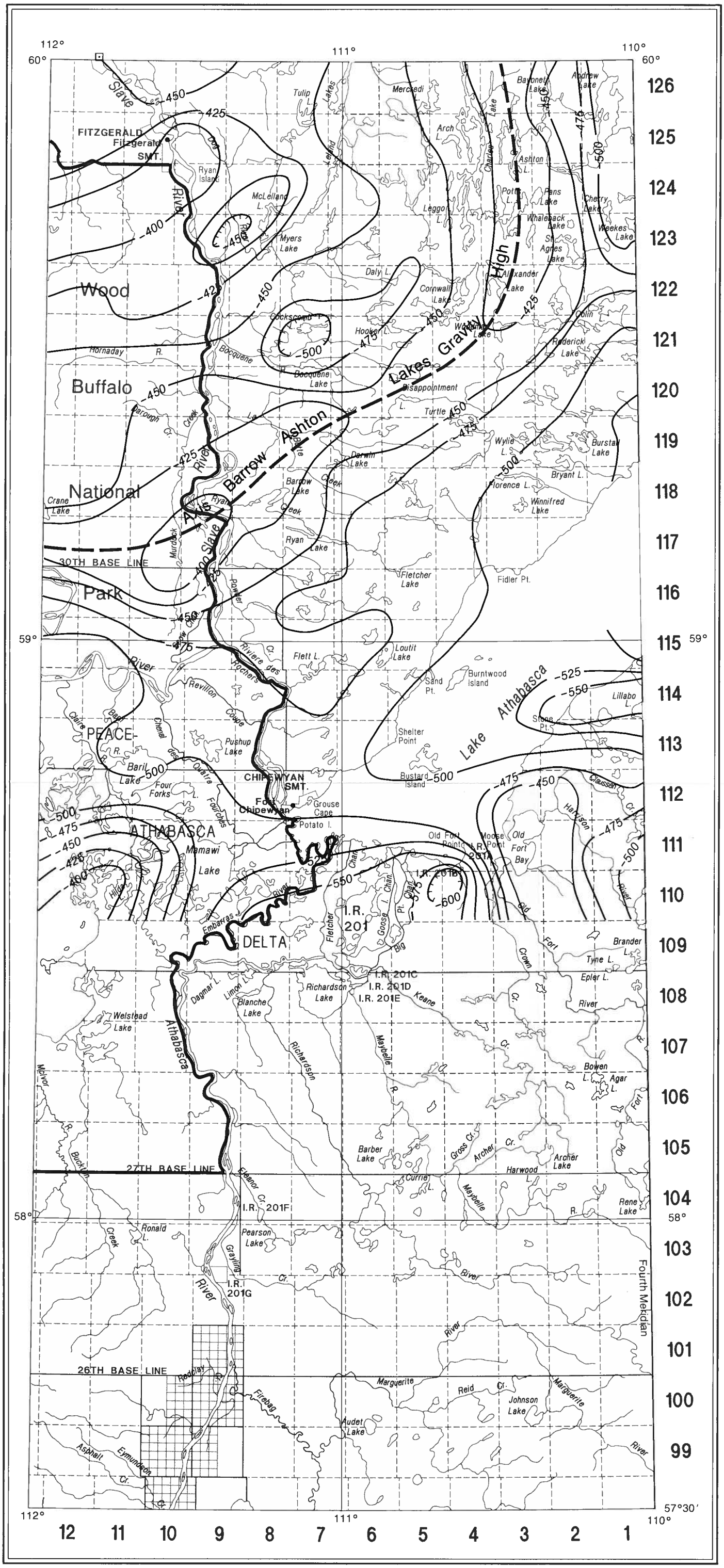


Figure 5. Bouger gravity map (simplified from Sprenke, Wavra and Godfrey, 1986).

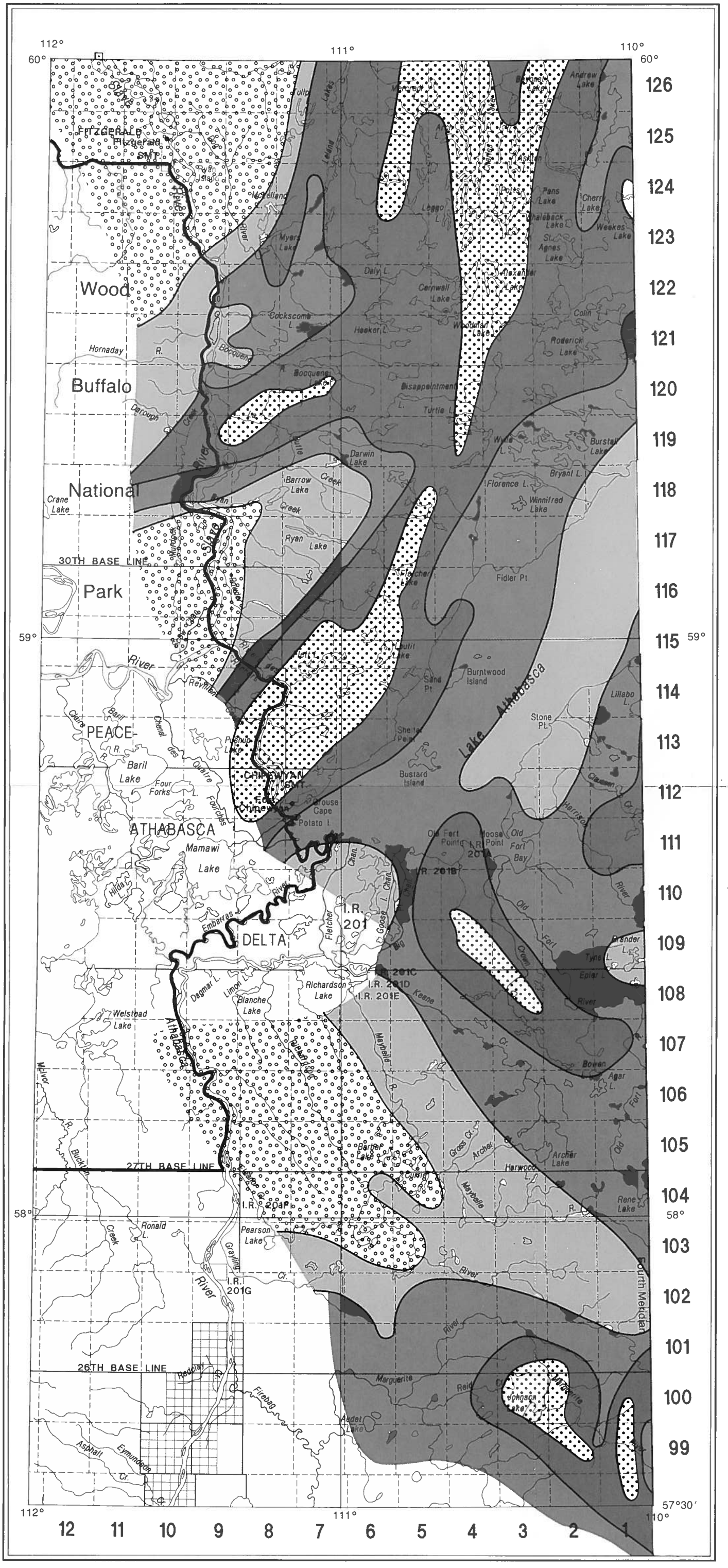
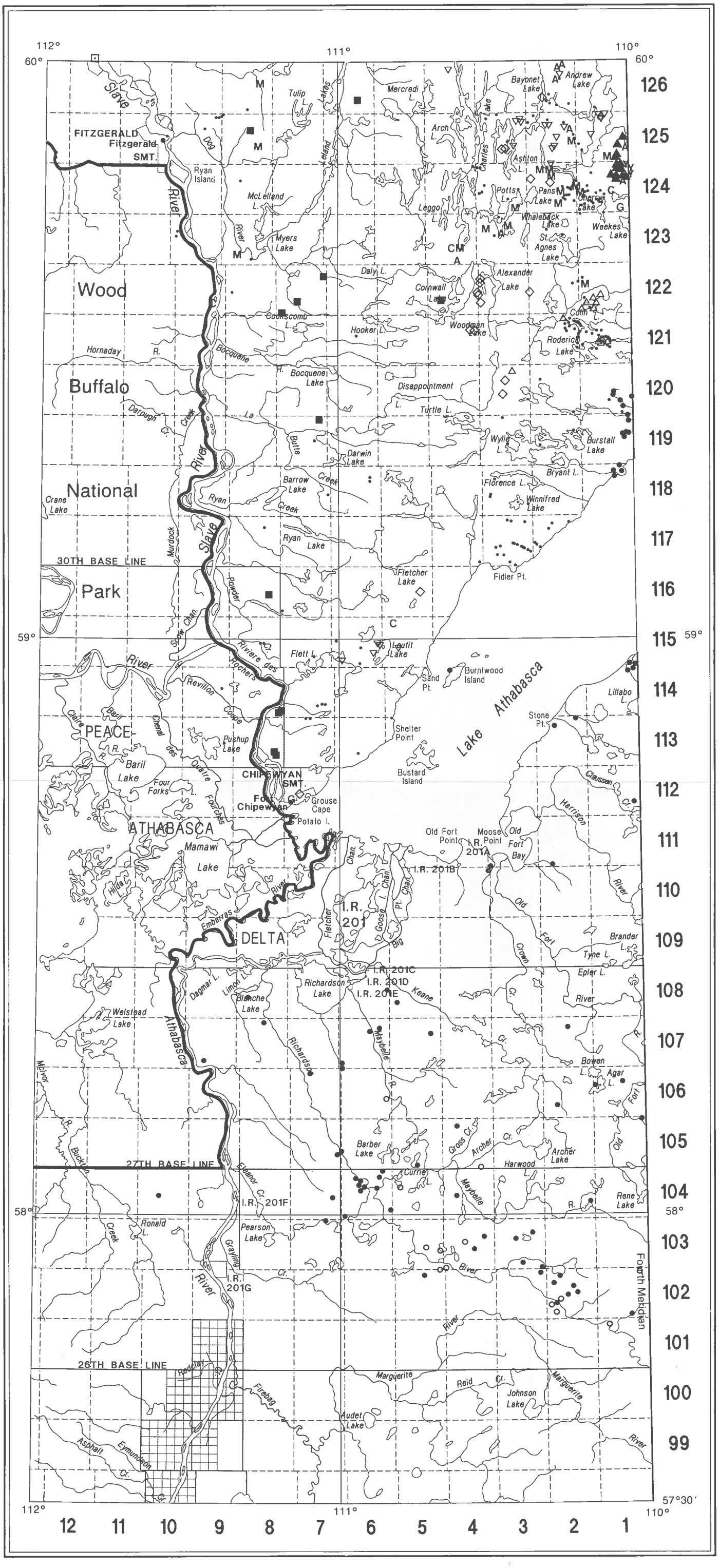


Figure 6. Magnetic trends (simplified from Sprenke, Wavra and Godfrey, 1986).



Legend

Uranium site (yellow stain and/or radioactivity)	•
Allanite site	◇
Building stone site	■
Rock alteration site (could be saprolite related)	△
Tourmaline-quartz veins site	▲
Graphite	▽
Sulfide site	
Pyrrhotite	Y
Chalcopyrite/Malachite	C
Arsenopyrite	A
Molybdenite	M
Gossan	G
Drill core (M.C.R.F.)	●
Drill core (Eldorado Nuclear Ltd.)	○

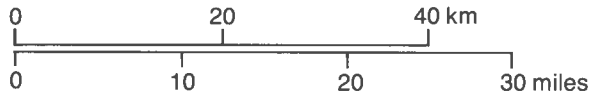


Figure 7. Drill cores and mineral showings (simplified from Wilson, 1985 and Godfrey, 1986).