MAR 19770004: NORTHEAST ALBERTA

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ELDORADO NUCLEAR LIMITED

EXPLORATION DIVISION

Ottawa, Ontario

19770004

Project 508

North-East Alberta Permits

(Quartz Mineral Exploration Permits No's 185, 186, 187, 214, 215, 216, 217 and 218.)

PROGRESS REPORT ON RESULTS OF WORK

DONE DURING SUMMER 1976 AND WINTER 1976/77

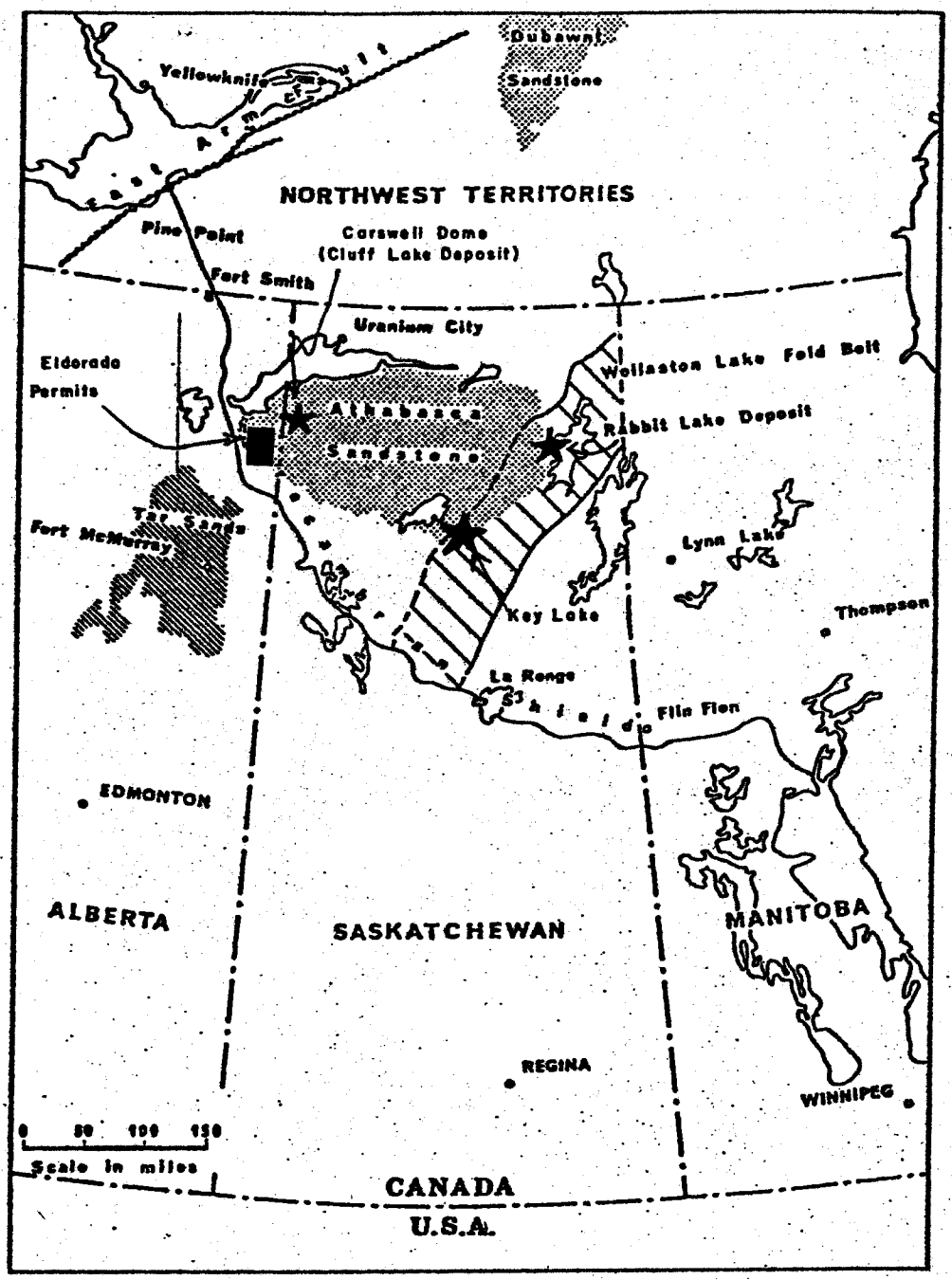
Hugo Laanela
Project Geologist
Project 508 (NE Alberta Permits)

March, 1977, Ottawa

File: 508-50 (1976/77)

19770004

FIGURE 1



PROJECT 508

LOCATION MAP

SUMMARY

The Project 508 area, consisting of eight Quartz Mineral Exploration Permits, is located in the Richardson River-Maybelle River area, south of Lake Athabasca, in N.E. Alberta. Eldorado Nuclear Limited has been engaged in uranium search here since May, 1975.

Originally, during 1974-1975, the Project area consisted of 3 Permits (185, 186 and 187), now referred to as the "Northern Permits", totalling 234 square miles. After the first season's field work, in late 1975, the area of these Permits was reduced to 140 square miles. Additional five Permits (214 to 218), now referred to as the "Southern Permits", totalling 244.75 square miles, were obtained in early 1976. The total area of the 8 permits is now 384.75 square miles (= 246,240 acres or 997.31 km^2).

The search area is along the geologically favourable S.W. edge of the Athabasca sandstone. Except for some granitic outcrops in and near the very S.W. corner of the Project area, there are no other outcrops in the area. The glacial overburden in thick, often in excess of 100 feet. Uncertainty regarding the actual location of the edge of the Athabasca Formation has been a major problem since the inception of the exploration program. In 1974 it was thought that this edge, which marks the unconformity between the Athabasca sandstone and Precambrian basement, lies along the N.E. boundary of Permit 185. Field work during 1975 indicated that this is not so, that this edge is probably much farther toward the S.W., somewhere between Maybelle and Richardson Rivers. Hence the five additional permits were obtained in the Richardson River area and the 1976

work was done mostly here. The Winter Drilling Program, 1976-1977, was carried out to test this assumption.

The drilling results now indicate the edge of the Athabasca Formation is within the Permits 214, 215 and 216, between the above two rivers. The exact shape and location of the edge is by no means yet certain, and can only be determined by further work, including drilling. It now appears that the "Northern Permits" (185, 186 and 187) are entirely underlain by thick (400'±) Athabasca Formation sandstone, which, in turn is (in parts) overlain by calcareous Devonian mud- and sandstone. Hence these three original permits are of very little interest now, considering this thickness of cover.

The above description also applies to the "open ground" (former Uranerz - INEXCO permits) between the "Northern" and "Southern" permits, possibly with a few minor exceptions.

Aside from the above, the two past summers (1975 and 1976) were spent doing various regional surveys. These included regional lake (and stream) sediment and water geochemistry, some semi-detailed soil sampling to test the areas of lake-geochemical anomalies, radiometric prospecting, and boulder mapping. The 1975 work was done on the Permits 185, 186 and 187, and in the adjacent areas. The 1976 work was done on the Permits 214 to 218, and in the areas adjacent to these; this work was more productive since it outlined several water and sediment geochemical anomalies by the end of summer 1976.

A grid, consisting of 100 miles of linecutting, was also laid out on Permits 215, 216, 217 and 218. This was soil sampled and some resistivity survey lines were run on

it. A number of granitic outcrops were located and mapped on these permits.

An airborne Mag.-E.M. survey, covering an area of about 230 square miles over the five "Southern Permits" is scheduled for the end of April, 1977. The results of this survey, plus the previously located lake geochemical anomalies and the information from the drilling will provide areas of interest for ground surveys to be carried out during the summer 1977. This ground work will consist mainly of the following: extending the previous line grid to cover the areas of interest, and doing geochemical and geophysical surveys on this grid. The geophysical methods would include V.F.L.-E.M., magnetics and resistivity. Other activities include a semi-regional muskeg-geochemical survey, detail prospecting and mineralized boulder hunting, and (possibly) a soil gas survey. Further drilling if and where warranted, would be done during winter of 1977-1978, after all the results are compiled.

A Budget of $ 369,400. is allocated for 1977.

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Diamond Drill Logs:

D.D.H.'s #508-1 to 16 inclusive
(drilled Winter 1976 to 1977)

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508-22 (1976-Map # 2):	Ratios of Basement to Athabasca Sandstone Boulders, 1:50 000
508-22 (1976-Map # 3):	Ratios of "Oil-stained" to "Clean" Sandstone Boulders, 1:50 000
508-40 (1976-Map # 4):	Geochemical Anomalies in Muskeg, 1:50 000
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B. Large Maps, con't.

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508-40 (1976-Map #19):	Sheet B - A_o Horizon Sample Locations and Numbers, 1:10 000
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508-26 (1976/77-Map #24):	Drill Hole Locations, Winter 1976-77, 1:50 000
508-26 (1976/77-Map #25):	Locations and Sections of Diamond Drill Holes: DDH Nos. 508-1 to 508-16 (1976-1977 Winter Program), 1:50 000
508-38 (1976-Map #26):	Resistivity Survey Index - 1976, 1:50 000
508-74 (1976/77-Map #27):	Proposed Linecutting and Grid Layout for Geophysical and Geochemical Surveys, 1977 (showing also 1976 linecutting grid), 1:50 000
508-33 (1977-Map #28):	Proposed Airborne Survey - 1977, 1:50 000

→ see note on the back of the previous page ←

C. Graphs (separate, not in report):

Resistivity Survey, August, 1976 - Refer to Index Map 508-38 (1976-Map #26)

Graph 1: Lines 7E and 8.5E
Graph 2: Lines 11E and B.L. 10E
Graph 3: Lines 13E and B.L. 10N
Graph 4: Lines 21.5E and B.L. 12N
Graph 5: Line B.L. 20E
Graph 6: Wenner Arrays (Depth Probe)

I. LOCATION AND ACCESS

The Project 508 (Permits 185 to 187 and 214 to 218) areais within the S.W. edge of the Precambrian Shield in N.E. Alberta, about 30 to 60 miles south of west end of Lake Athabasca, and about 100 miles N.N.E. of Fort McMurray.

There are no roads in the permits area, although a winter road passes the Richardson airstrip which is about 12 miles W.S.W of the Eldorado Base Camp. Some winter roads used in the tarsands project reach also within 20 miles of the permits, to the south (in Audet Lake area)

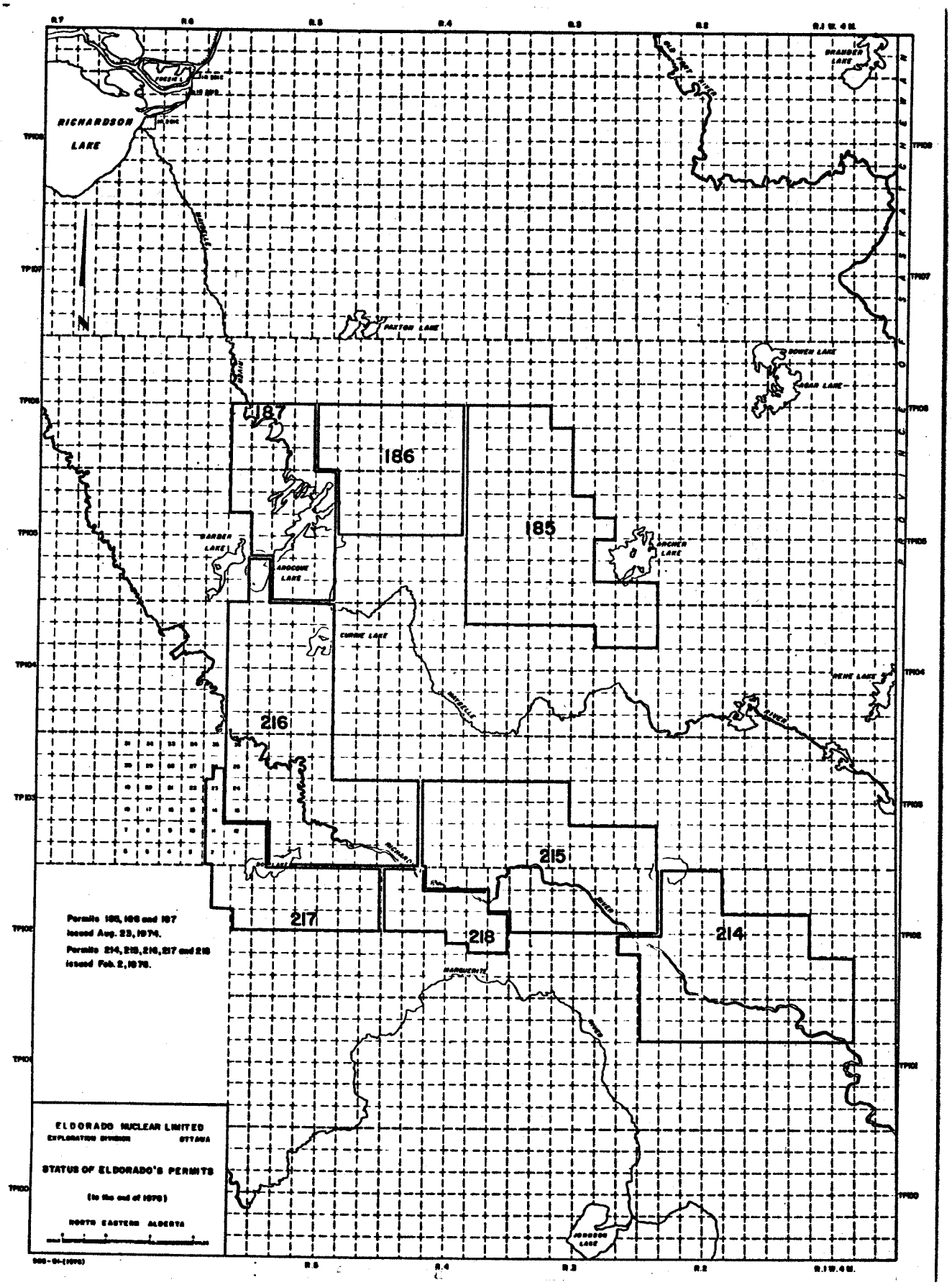
The Base Camp is at the south end of an unnamed lake, located in Township 103, on the boundary of Ranges 4 and 5. This lake is about one mile long, suitable for any float-plane landing.

Large part of the area is covered by muskeg and lakes. These tend to have a north-south trend, particularly in the northern part of the project area (where the trend becomes N.E.-S.W.). This greatly hinders traversing in the summer, particularly in east-west direction.

The project area can be reached by float-planes based in Fort McMurray (about 100 miles), Fort Chipewyan (50-60 miles) and Uranium City (about 140 miles). It is about 300 air miles north of Edmonton.

19770004

FIGURE 2



II. PROPERTIES AND TENURE

The Project 508 area consists of eight Quartz Mineral Exploration Permits as follows:

a) "Northern Permits":

PERMIT NO.	DATE ISSUED	ORIGINAL ACREAGE	FIRST RENEWAL	ACREAGE REDUCED TO	FINAL RENEWAL*	ACREAGE RENEWED
185	Aug 23/74	49,920	Aug 23/75	41,600	Aug 23/76	41,600
186	Aug 23/74	49,920	Aug 23/75	24,960	Aug 23/76	24,960
187	Aug 23/74	49,920	Aug 23/75	23,040	Aug 23/76	23,040
TOTAL ACRES		149,760		89,600		89,600

* Permits issued for 3 years only. Can be renewed as leases in 1977.

b) "Southern Permits":

PERMIT NO.	DATE ISSUED	ORIGINAL ACREAGE	FIRST RENEWAL	ACREAGE RENEWED	FINAL RENEWAL	ACREAGE RENEWED
214	Feb. 2/76	39,680	Feb. 2/77	39,680	Feb. 2/78	
215	Feb. 2/76	39,680	Feb. 2/77	39,680	Feb. 2/78	
216	Feb. 2/76	47,360*	Feb. 2/77	47,360	Feb. 2/78	
217	Feb. 2/76	20,000	Feb. 2/77	20,000	Feb. 2/78	
218	Feb. 2/76	9,920	Feb. 2/77	9,920	Feb. 2/78	
TOTAL ACRES		156,640		156,640		

* Applied for 49,920 acres, which was reduced upon issue.

The total present acreage: 246,240 acres = 384.75 square miles = 997.31 km^2 (in 8 permits).

The following payments have been made to the Provincial Treasurer of Alberta re. above permits:

	*	**		***		****	
PERMIT NO.	DEPOSIT $ (ON ISSUE)	1st YEAR FEE ($)	ISSUE DATE	2nd YEAR FEE ($)	RENEWAL DATE	3rd YEAR FEE ($)	RENEWAL DATE
185	5,000	625	Aug 23/74	4,160	Aug 23/75	6,240	Aug 23/76
186	5,000	625	Aug 23/74	2,496	Aug 23/75	3,744	Aug 23/76
187	5,000	625	Aug 23/74	2,304	Aug 23/75	3,456	Aug 23/76
214	3,000	475	Feb. 2/76	3,968	Feb. 2/77		Feb. 2/78
215	3,000	475	Feb. 2/76	3,968	Feb. 2/77		Feb. 2/78
216	5,000	625	Feb. 2/76	4,736	Feb. 2/77		Feb. 2/78
217	2,000	250	Feb. 2/76	2,000	Feb. 2/77		Feb. 2/78
218	1,000	125	Feb. 2/76	992	Feb. 2/77		Feb. 2/78
TOTAL $	19,000	3,825		24,624		13,440	

* Deposit: $1,000 per 10,000 acres (or portions thereof); refundable.

** 1st year fee: $125 per 10,000 acres (or portions thereof)

*** 2nd year fee: $0.10 per acre.

**** 3rd year fee: $0.15 per acre.

Permits can be issued for 3 years only. Thereafter leases can be applied for at a rate of $0.25 per acre for the first 5 years and thereafter at a rate of $1.00 per acre for the remainder of the 21 year term. (See Alberta Regulation 377/67)

III. REGIONAL GEOLOGY

The area south of Lake Athabasca in Alberta is covered with thick glacial overburden (average depth about 100 feet in the area of the permits). The only outcrops known in the area are the Precambrian granites and granitic gneisses in the Marguerite and Richardson rivers area near the southern edge, and south of the Project. No Athabasca sandstone (nor any other sedimentary) outcrops were encountered in the area during the last two summers spent here. The closest observed outcrop of Athabasca sandstone was observed just across the Saskatchewan boundary on Beatty River, about 30 miles N.E. of Base Camp. Hence no bedrock geology maps exist of the area (except the "Geology of Marguerite River District, Alberta" by J.D. Godfrey of R.C.A.).

The edge of the Athabasca Formation marks the unconformity between the underlying Archean (and including Aphebian) basement rocks and overlying Helikian Athabasca sandstone. It has proved to have the highest potential for finding uranium deposits in Canada (witness the Cluff Lake, Rabbit Lake and Key Lake uranium discoveries).

It was realized early during the 1975 field season that the S.W. boundary of the Athabasca Formation in Alberta, as shown on various governmental geology maps, was in error. This was determined mainly by mapping the very numerous and often angular Athabasca sandstone boulders in the original three permits (185, 186 and 187) area. By the end of the summer, 1975, it appeared evident that this sandstone edge lies somewhere S.W. of the Maybelle River, and that these three permits are probably completely underlain by the Athabasca Formation. However, no direct evidence of this could be seen. To complicate matters further, it was also thought that there may exist buried remnants of a dolomitic

or limestone "capping", apparently of Devonian age (Dm), overlaying this sandstone in the southern parts of the above three permits. This was suggested by several occurences of numerous dolomitic limestone slabs, containing Devonian fossils, in the area. Again, no outcrops were seen. Also, this presence of the Devonian "capping" over sandstone could conveniently explain the presence of much "dead oil stain" that was found in the boulders of Athabasca sandstone, probably originating from the "tarsands" to the south.

As a consequence of these assumptions, it appeared by the end of the 1975 season that the Permits 185, 186 and 187 were of limited interest, and that more interesting ground should be taken up toward the south and southwest where the edge of the Athabasca sandstone was assumed to be. Hence five new permits (214 to 218) were applied for in the Richardson River area in the fall of 1975. Most of the work done during 1976 was in the area of these new permits.

However, any geological information regarding the bedrock geology, including the actual location of the sandstone edge, remained as elusive as before. Only after the diamond drilling was carried out during the winter of 1976-1977, could the actual sandstone edge be determined to lie within the area between the Maybelle and Richardson rivers - and somewhat farther to the south and southwest than where it appeared to be in late 1975. The exact location of it is not yet by any means certain.

The drilling also revealed that the Devonian rocks cover a much wider area than originally thought.

111° 00'

110° 00'

58° 00'

RICHARDSON LAKE

MAYBELLE RIVER

KEANE RIVER

PAXTON LAKE

BOWEN LAKE

AGAR LAKE

Eldorado Camp

ARCHER LAKE

Sask.–Alta. Boundary

RICHARDSON RIVER

BARBER LAKE

CURRIE LAKE

MAYBELLE RIVER

RENE LAKE

DOG LAKE

RICHARDSON RIVER

MUDDY LAKE

MARGUERITE RIVER

MARGUERITE RIVER

MUDET L.

JOHNSON LAKE

GEOLOGICAL REFERENCE

Generalized after L.A. Bayrock (R.C.A.) 1969/70

RECENT

F 739 — **ALLUVIAL DEPOSITS**
Stream alluvial: sand and silty sand along stream.

E 740.5 — **AEOLIAN DEPOSITS**
Aeolian sand and dunes: med. grained quartzite sand, 2'–10' thick in sheets, thicker in dunes.

PLEISTOCENE

D 737 — **GLACIOFLUVIAL DEPOSITS**
Outwash sand: medium to coarse grain, with pebbles and gravel lenses.

C 734.5 — Outwash sand & gravel: medium to coarse, large boulders; thin cover.

B 735 — Outwash sand and gravel overridden by glacier: flutings and drumlinized outwash of thick sand, gravel and large boulders.

A 738.5 — Ice–contact deposits: sand gravel and large boulders, rolling hills; kame deposits, eskers, and moraines, crevasse filling, etc.

PRECAMBRIAN

pC 744 — Outcrop areas of Aphebian granites, gneisses and metamorphics

Direction of ice–movement (inferred from glacial flutings and other glacial features.

Permits held (No. 185, 186, 187, 214, 215, 216, 217 and 218.)

FIGURE 3

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OTTAWA

GENERALIZED SURFICIAL GEOLOGY OF NORTHEASTERN ALBERTA PERMITS

N.T.S. MAP AREAS 74L/1/2/7/8 & 74E/9/10/15/16

SCALE 4 2 0 4 8 MILES

H.L./W.J.S.

508–22 (1976)

Surficial Geology and Landforms

The surficial (Pleistocene) geology in N.E. Alberta has been mapped by L.A. Bayrock of Research Council of Alberta during 1969 and 1970. The results have been presented on two 1:250 000 map sheets, Fort Chipewyan Sheet 74L and Bitumont Sheet 74E, both with marginal notes. References are made to these notes in the following discussion of the glacial, etc., units in the project area:

RECENT:

Alluvial deposits:

Stream alluvium: sand and silt along major streams.

Aeolian Deposits:

Wind-blown sheet sand and sand dunes. Mostly to west and N.W. of project area where they cover large tracts.

PLEISTOCENE:

Glaciolacustrine deposits:

Thin sand cover over glacial outwash; includes abandoned beaches. North of project area, near Athabasca River delta.

Glaciofluvial deposits:

a) Outwash plains, nearly flat to gently undulating. Largely to north and west of the project area, and also covering most of the area along Marguerite and Richardson Rivers to the south. The outwash plains west of Old Fort River contain mainly medium to coarse grained sand derived from the Athabasca sandstone Formation; here they are thicker than to the N.E. Approximately 65 feet of outwash sand is exposed on the Athabasca River near Embarras airstrip, and similar

thicknesses have been observed on the Richardson and Maybelle Rivers to the east (Bayrock, 1969/77). Two main types are sand outwash plains and gravel outwash plains; the first type consists of medium to coarse grained sand with pebbles and gravel lenses, the second type consists of medium to coarse sand and gravel and may contain large boulders. Also found are meltwater channel sediments, but mostly outside of the project area, along the Athabasca River valley. Numerous small melt water channels are also associated with the kame and outwash plain complex (not shown on map here).

b) Glaciated outwash plains could be considered as the third type of the above outwash plains, consisting of sand and gravel that has been overidden by a subsequent ice advance to form a fluted and drumlinized surface, indicating the direction of ice movement. They are prevalent toward the southern part of the Permits 185-187, and extend southward within 3-4 miles of Richardson River, hence rather central to the area. These contain many rounded to angular cobbles and boulders of sandstone, often in large numbers locally.

c) Drumlins occur in large swarms on Permits 185, 186 and 187 and in the central area; they are generally covered by boulder pavement, are composed of the youngest drift and lay several miles back of the end-moraines. The inter-drumlin areas contain sand and gravel near the surface. The drumlins generally trend to the S.W. and are well shaped. Flutings are also well developed and grade in places into drumlins. They extend, together with small drumlins, onto the outwash plains south of Lake Athabasca, where they become covered by younger outwash deposits.

Ice-Contact deposits:

These are widespread and cover much of the area in the northern part and to the east of Permits 185-187.

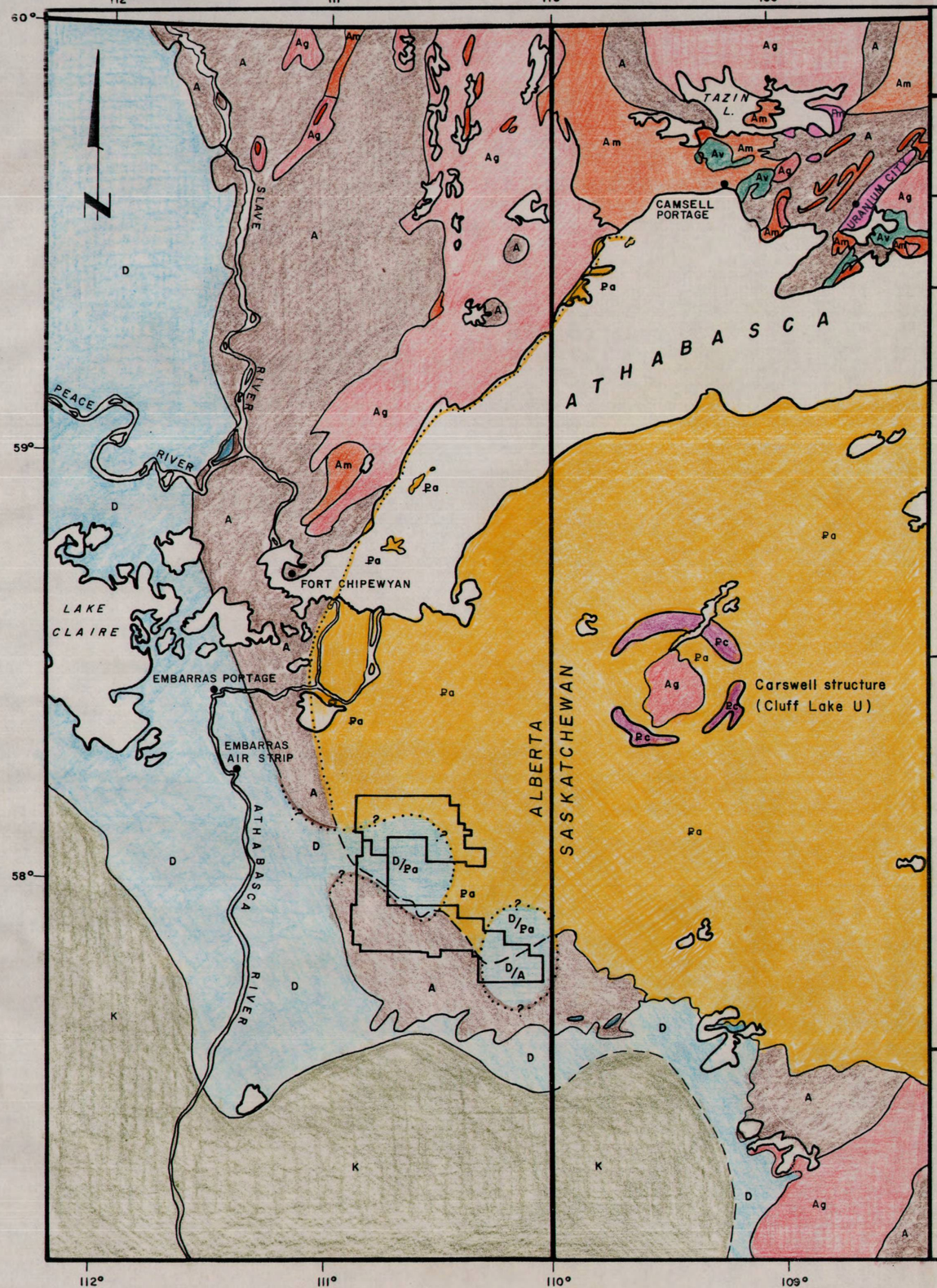
They also occur along Maybelle and Richardson Rivers toward south. They consist of a complex of kames, eskers, moulin kames and crevasse fillings, and vary widely in texture.

a) Kame deposits are ice contact features (perforation deposits) forming mounds, small basins, "kettles", etc., composed of sand and gravel to coarse boulder gravel. Having a local relief ranging from 100 to 600 feet, they form a series of N.W. trending end-moraines in continuation with the Cree Lake Recessional Moraine toward S.E. in N.W. Saskatchewan. As end-moraines, they mark the different terminal positions of glacial advances (ice fronts). If it is assumed that the bedrock surface underlying the kame complexes is concordant with the lowlands to the south and east, then the thickness of these sand and gravel deposits is approximately equal to the local relief (Bayrock, 1969/70).

b) Crevasse fillings, trending mostly N.W. to S.E. and associated with the kame moraines, are relatively high and sinuous, grading into small eskers. They are mostly composed of gravel.

c) Eskers, long sinuous ridges spaced several miles apart and trending S.W., are found in the permits 185-187 area and N.E. of these; they indicate stagnant ice conditions. A number of eskers are found to extend south-westerly across the central drumlinized outwash plains, and generally parallel the drumlins. Toward the N.E. they often branch off into crevasse fillings.

19770004 FIGURE 4



GEOLOGICAL REFERENCE & CORRELATION

EON	ERA	MAP SYMBOL	LITHOLOGY, FORMATIONS, ETC.	Correlation of 1:267,200 Provincial geology units: Alberta	Saskatchewan	G.S.C. Map of Canada
MESOZ.	CRETAC.	K 739.5	SEDIMENTARY ROCKS: Shales, Siltstone, Sandstones, "Oil sands" (Km)	Ks Kc Kg Km	Km	2uK 1K
PALEOZ.	DEVON.	D 740.5	SEDIMENTARY ROCKS: Limestones, Shales, Dolomite, Gypsum	Dc, Dw, Dn Dmg, Dk, Dm	Dm	uD mD
			~~ MAJOR UNCONFORMITY ~~~			
PROTEROZOIC	HELIKIAN	Pc 752	CARSWELL FORMATION: Dolomite (domal structure)	—	Pc	5IP
		Pa 735	ATHABASCA FORMATION: Sandstone, Conglomerate, minor Shale	Pa	Pa	4IP
	APHEBIAN	Pm 928	MARTIN FORMATION: Siltstone, Shale, Sandstone, Conglomerate, some diabase & Volcanics	—	Pm	uA
			~~ UNCONFORMITY ~~~			
ARCHEAN			ARCHEAN BASEMENT COMPLEX	*	*	*
		A 746	UNDIFFERENTIATED: Plutonics with Gneiss & Metasediments (Alberta) Pelitic Schist & Gneiss grading into Migmatite & Mylonite (Sask.) includes Tazin Group rocks	A	P4 grading into P9	A1gn An
		Am 737	METASEDIMENTS: Quartzite, Biot. Sch., Amphibolite Gneiss, undifferentiated Metasediments, Schists & Gneisses	Am	P3, P5, P6	2An
		Av 739	METAVOLCANICS: with Graywacke & Schist.	—	P2	2An
		Ag 744	GRANITE: and Granitic Gneiss	Agg, Ag and Ap	P1	A1gn An 2An

(* Correlation subject to revision)

☐ Permits held (# 185, 186, 187, 214, 215, 216, 217 & 218.)

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GENERALIZED PRECAMBRIAN GEOLOGY OF N.E. ALBERTA AND N.W. SASK.

SCALE 20 10 0 20 40 MILE

H.L. / W.J.S. Scale: 1" = 20 Miles.

508-22(1976)

Bedrock Geology

Briefly, the main bedrock units in the general area are:

Mesozoic: Cretaceous sediments (including rocks at McMurray "tarsands") farthest toward south and west, some 20 miles south of the southern boundary of the Project area. (The oil from these rocks probably migrated north and was trapped in the Athabasca sandstone.)

Mid-Devonian dolomites, limestones, mudstones and allied carbonate rocks occuring mainly outside of the permits. The results of diamond drilling shows that these rocks occur also in the Project area, forming a "capping" over Athabasca sandstone.

Proterozoic: The Athabasca Formation (Helikian). It underlies probably all of the Permits 185, 186 and 187 and northern parts of Permits 214, 215 and 216. It rests unconformably on the crystalline Precambrian Basement Complex. Known outcrops occur near the south shore of Lake Athabasca and in the Carswell Circular Structure (Cluff Lake area); the closest outcrop to the Project area is on Beatty River, just inside Saskatchewan boundary (30 miles N.W. of camp).

Archean and/or Proterozoic: The Precambrian Basement Complex, rocks the Canadian Shield, underlying the Athabasca sandstone. These crystalline rocks

consist of granite and allied gneisses, metasediments, metavolcanics, pegmatites and dike rocks. Nearest outcrops are the Aphebian (?) granites and gneisses in the Marguerite River area, and also in the Dog Lake and Richardson River areas, on Permits 215, 216, 217 and 218. (In the Marguerite River area they have been mapped by J.D. Godfrey - Research Council of Alberta - 1969, on a 1 in. to 1 mile scale.)

per AP 90

Of particular economic interest in the Athabasca Basin area is the major unconformity between the essentially flat-lying, undisturbed Athabasca Formation (Helikian), and the underlying Aphebian/Archean basement complex of highly metamorphosed crystalline rocks and its regolithic paleo-surface. This boundary has only tentatively been established in the Precambrian part of Alberta south of Lake Athabasca due to lack of outcrops and insufficient drill-hole data. During the 1975 Field Season, it became evident that this boundary, as shown on governmental, et al, geology maps was incorrect and that it probably lies further out toward south and west, probably somewhere between the Maybelle and Richardson Rivers. Based on 1976-1977 drilling program, it is now assumed that the Athabasca sandstone underlies all of the Permits 185, 186 and 187 and also the area south of these permits. A large percentage of the prevalent sandstone boulders contain "dead oil stain", both massive and in zebra-striped "fingers". This oil was also seen in some drill core. It is thought that this oil originated from a later Cretaceous source (e.g. McMurray Formation to the south?). Possibly a "trap" was formed in the Athabasca sandstone by a "dolomitic cap" of carbonate Devonian rocks, the evidence which could be found in finding slab-like dolomitic boulders in a few places in the permits' area, and also from recent drill hole data. Probably part of this "cap" was later removed by glaciation. Athabasca sandstone boulders, particularly

the oil-stained variety, were frequently found in great abundance, and also in large angular blocks and slabs, thus suggesting that their subsurface origin was not far from their place of glacial deposition. Some sections of drill core were also heavily oil stained.

The thickness of the Athabasca Formation in the permits area is not yet well known, but based on drill hole information it appears to considerable, i.e. in the order of hundreds of feet. It is also reasonable to expect that this edge of the sandstone (=unconformity) is irregular rather than a smooth line, with attendant "basement windows" and sandstone outliers (this is seen to happen in Saskatchewan).

The Aphebian basement rocks show some good outcrop exposures in the Marguerite area. Dr. Godfrey (1969) has described a wide variety of lithologies here, both crystalline and metamorphic, frequently associated with radiometric anomalies, minor "yellow stain" (uranium), and other minor metallic minerals. The follow-up work on these occurences, done by Eldorado during 1975 in the main Marguerite River outcrop area, and on the "southern" permits during 1976, however, failed to reveal any mineralization of economic significance so far. The Aphebian rocks are mainly gneissic granites, granodiorites and monzonites and their mylonitized derivatives, probably with some associated metasediments, metavolcanics and various pegmatitics. They form series of hills and knobs with well rounded "crag-and-tail" (glaciated) features, separated by depressions filled with muskeg swamps, small lakes, and sand and gravel. Trend of the foliation and gneissosity varies from W.N.W. to N.N.E. in Godfrey's map area, with the N.W. to north being most dominant.

This arcuate trend in the Marguerite area shows up also on 1-mile governmental aeromagnetic maps, although

over a much wider area than the area of the above outcrops, widening toward and across the Saskatchewan boundary. It appears to be part of a series of N.E. trending zones in Saskatchewan where the magnetic relief is great and is associated with fold-belt metamorphics such as the Wollaston Belt. On the permits area this magnetic relief is seen to be particularly well developed on S.W. parts of Permits 214, 215 and over most of 214. This in turn seems to suggest that the fold-belt type of metamorphics may underlie at least parts of these three permits. At present we do not have enough data to confirm this assumption.

Further toward north (Permits 185-187 area) the government aeromagnetic maps show largely low relief and sweeping N.N.W. trends (and not much local detail nor deviation). This seems to indicate that the basement rocks there may be similar to the rocks in the N.W.T. directly to the north.

Uranium Potential

During the past few years the edge of the Athabasca Basin, particularly in Saskatchewan, has become one of the regions with the highest uranium potential in Canada. Examples of past discoveries are: Eldorado (Beaverlodge), Gunnar, Rabbit Lake, Cluff Lake (Carswell Dome) and Key Lake.

The geological concepts concerning the uranium emplacement have undergone a great change during these last few years: It has been shown that the uranium mineralization is related to near surface processes taking place at peneplanation surfaces, involving weathering, leaching and re-precipitation. Multiple reworking of uranium minerals will thus take place adjacent to major unconformities such as the base of the Athabasca Formation, and resulting in the deposition

of vein-type uranium in the favorable structural "traps" in the regolithic Archean/Aphebian paleosurface below the sandstone cover.

The sediment and water sampling of the lakes in the Project area has indicated a number of geochemical anomalies, particularly toward the south, in the Dog Lake and Richardson River vicinities. So far no uranium has been seen here in the boulders nor in outcrops. Hence the potential and significance of these anomalies remains yet to be determined.

It is suspected that the most significant and intensive of these geochemical anomalies (particularly the anomalies showing good correlation between U, Cu, Ni and Co values both in lake waters and sediments) may be located some distance "down ice" from the unconformity between the Aphebian basement and the Helikian sandstone in the Richardson River area and which may contain uranium mineralization.

Minor radioactive "yellow stain" was observed on a few locations (some are indicated on Godfrey's map) south of Marguerite River, usually as a thin coating on the weathered surface of biotite rich gneissic rocks. The prospecting has been rather limited here. Prospecting of the granitic-gneissic outcrops in the southern part of the permits has not located such stain there. The glaciation has apparently removed much of the favorable regolithic paleosurface in these exposed areas.

IV. RESULTS OF WORK DONE DURING SUMMER 1976 AND WINTER 1976-1977

General

Review of 1975 work (mid-May to end of August): The field work done by Eldorado during the previous summer covered the original Permits 185, 186 and 187 and areas immediately adjacent to these permits. Some reconnaissance prospecting was also carried out in the Marguerite River outcrop area, and in the Richardson River area. The work on these three permits consisted of lake water and sediment sampling, boulder mapping, and soil sampling (using pace-and-compass with airphoto control) of some lake-geochemical anomalies. A few reconnaissance type EM-16 traverses were also run.

The main outcome of the 1975 program was the discovery that the above three permits appeared to be extensively underlain by Athabasca Sandstone and the subsequent decision to acquire the additional five permits (214 to 218) to the south, toward where the edge of the sandstone was thought to be. A geochemical reconnaissance of the lakes in the area to the south indicated some larger and more intense anomalous areas there.

The field work during the summer of 1976 was carried out mainly in the new "southern" permits area (214 to 218) and it consisted of a similar program - water and sediment sampling, prospecting, boulder mapping, etc. In addition, about 100 line miles of grid was cut which was soil sampled, and on which a few reconnaissance lines of resistivity survey were run. As during the previous season, the main problem was the lack of geological information, due to lack of outcrops, and the resulting uncertainty regarding the location of the edge of the Athabasca sandstone (=unconformity)

To remedy this situation, a diamond drilling program was started in November, 1976, completed in February, 1977. The results of this drilling confirmed the suspicion that the Permits 185, 186 and 187 and also much of the area south of these was not only underlain by Athabasca (Helikian) sandstone, but by Devonian calcareous sediments as well.

Boulder Mapping and Prospecting

The Permits 214 to 218 and the adjacent area, particularly to the north, were covered during 1976 by ground traverses at about 2-3mile intervals, joining up with the Permits 185 to 187 area to the north, similarly traversed during 1975. The purpose:

a) to locate any outcrops,
b) to find any radioactive or mineralized boulders or boulder trains,
c) to find any granite, et al, basement boulders in order to determine the presence of any Aphebian/Archean basement subcrops,
d) to observe the angularity, size, ratios and frequency of boulders, particularly sandstone and limestone, in order to determine the proximity and depth of their source, and
e) to determine the extent of "dead-oil-stained" sandstone.

Regarding a) above, a few additional small granite or granitic gneiss outcrops were located (see Map #1). No Athabasca sandstone or Devonian outcrops were seen.

No mineralized or radioactive boulders were seen. Perhaps the traverses were not detailed enough to eliminate the possibility of finding any such boulders some other time, eg. near the southern limits of the Project area?

Much of the southern part of the area is covered by muskeg and sand-plains, with hardly any boulders. In the areas of glacial deposits, the boulders were practically all sandstone, with occasional small, well rounded granite cobbles. The granitic boulder count increased significantly in the S.W. part of the Project area near Richardson River where the granitic outcrops started to occur, indicating that the ice-movement had passed the edge of the Athabasca sandstone here.

Many sandstone boulders were "slabby" and angular, particularly toward the N.E., indicating a not-too-distant source. Oil stained sandstone boulders were found over most of the area, but most frequently on the central part of the map sheet in the Maybelle River vicinity. The eastern part of the area is almost oil stain free (eg. Permit 214).

Along with the observation of boulders on the traverse, continuous reconnaissance type prospecting of ground and boulders was done with SPP2 scintillometers. Some slightly radioactive granite boulders were found but no uraniferous mineralization.

Water and Sediment Sampling

The geochemical sampling of the "southern" permits and adjacent areas in 1976 was similarly a continuation of the 1975 program. However, in addition to U, Cu and Ni analysis, all samples were also analysed for Co. About 1,490 sites were sampled for lake, pond and sometimes stream waters and sediments, using a helicopter. An additional 112 stream sites were sampled, using a canoe, while doing a prospecting reconnaissance on the Richardson River.

The total population (both 1975 and 1976 sampling) of

each metal in a particular medium was plotted as cumulative percentage on either normal or logarithmic probability paper. (The "follow-up" and "fill-in" samples of anomalous areas, as well as the Richardson River samples were excluded from this treatment in order to avoid unnecessary bias.) The resulting curves on the probability graphs were then partitioned into as many component geochemical populations as practical, using the method published by A.J. Sinclair (see A.E.G. Special Volume No. 4, 1976). The resulting graphs are shown on their respective maps.

Supposedly such populations reflect differences in geochemical environments, which, in turn, are related to underlying geology and also to differing surficial (eg. glacial) features of the overburden. These relationships are not yet clear and need much further study by advanced statistical methods (eg. factor analysis).

Uranium in Water and Sediments

Uranium distribution in waters consists essentially of a large (more than 99% of total samples) logarithmically distributed "background" population, on which a small (about 0.65% of total) highly anomalous population is superimposed. Their respective means are 0.04 ppb U and 0.40 ppb U. Furthermore, it is also assumed that the "mean plus two standard deviations" of the larger "background" population (more than 0.24 ppb U) is the threshold of "probably anomalous" values.

A glimpse at the map (#9) shows several interesting features:

a) except for some single sample or "spot anomalies" in the N.E. part of the property, all significant multi-sample anomalies occur on the Permits 214

to 218, or adjacent to these;

b) many water samples taken along the upper part of Richardson River are anomalous.

This last fact presents a problem which is not yet solved: The uranium anomalies in water along Richardson River (which includes tributaries issuing into the river) are the only anomalous values here - there are no significantly anomalous uranium values in sediments here, nor any significant copper, nickel or cobalt values either in waters or sediments. Either some kind of contamination should be suspected here (they were collected, shipped and analysed as a separate "batch" later in the season), or else these samples represent a completely different geochemical environment from the other water samples taken of the lakes and ponds. Therefore, Eldorado plans to do some control-sampling along the river during 1977 to solve this uncertainty.

Aside from these problematical river and stream samples, a number of other anomalous areas are outlined:

a) a large anomalous area south of Richardson River, on Permits 216, 217 and 218;

b) some anomalous ponds in the north part of Permit 215;

c) anomalous streams and lakes near Saskatchewan boundary, north of Permit 214.

All three above anomalous areas have corresponding uranium anomalies in sediments.

Uranium distribution in sediments consists of a large (80% of total) normally distributed "background" population (mean 0.7 ppm U), and three separate logarithmically distributed possibly or probably anomalous populations as follows: B=14%, mean: 2.0 ppm; C=3%, mean: 3.6; and D=3%, mean: 6.4 ppm U.

Because of "overlap" the exact limits of each are often ambiguous and subject to different interpretations.

The D population (the highest values) shows good correlation with uranium in water and hence is considered to be "definitely anomalous". The exception is a stream sediment anomaly along the eastern boundary of Permit 214, pointing to possible source in Saskatchewan.

Copper in Water and Sediments

Copper distribution in water behaves very similarly to uranium distribution in water: a large (99.2% of total) "background"population logarithmically distributed, with a mean value of 1.4 ppb Cu, and a small population (0.8%), with a mean of 8.6 ppb which is taken to be anomalous. However, these copper anomalies are largely small and erratic (ie. "spot highs") and do not correlate too well with other metals, including uranium, except in a few limited localities.

Copper distribution in sediments show a large (98% of total) normal background distribution (mean is 7 and mean + 2s is 13.5 ppm Cu). In addition, there are two anomalous, logarithmically distributed populations, one 1.5% of total (mean: 17.5 ppm Cu) and the other 0.5% of total (mean: 28 ppm Cu). There is some locally good correlation with uranium anomalies.

Nickel in Water and Sediments

Nickel distribution in water indicates three logarithmically distributed populations: a large (96%) "background" population with a mean of 2.0 ppb, and two possibly or probably anomalous populations, one about 3%, the other about 1% of total samples, with respective means of 7 and 9 ppb Ni. These high values occur largely as "spot highs" and

correlate poorly with any other anomalies.

Nickel distribution in sediments presents a much more interesting picture. First, five individual populations could be partitioned, giving a wide range of values. The lowest "background" population consists of 26% of total samples, with a mean of 3.7 ppm, and is normally distributed. The second lowest population is logarithmic, contains 52% of samples and has a mean of 9.0 ppm. It is too large to be considered as anomalous and probably represents another background population. The third population contains 20% of samples, is logarithmic and has a mean of 15.5 ppm. It may represent another background environment possibly related to glacial deposition, however some areas show correlation with uranium and other metals in which case it could be probably anomalous. The two remaining populations consist of 1.5% and 0.5% of samples, with respective means of 23 and 30 ppm Ni and are considered to be anomalous. Locally (eg. on northern part of Permit 215), the correlation with other types of anomalies is good.

Cobalt in Water and Sediments

Only the samples taken during 1976 were analysed for cobalt. Furthermore, a large number of samples analysed contained cobalt values below the "detection limit" (plotted at zero values). Hence maps on cobalt do not show the true results of sampling.

Cobalt distribution in waters appears to show two normally distributed populations. Because of "censored data" (in which 55% of values were below detection limit), the parameters of the lowest background population cannot be shown; it consists of about 50% of samples and has a mean "less than 1 ppb". The second population consists of the

remaining 50% of samples, with a mean of 3.2 ppb and standard deviation of 1.6 ppb Co; it probably represents another background population. The "mean plus 3s", at 8 ppb Co, is assumed to be anomalous. The few samples above this limit form mostly "spot highs", except a group of three samples in the northern part of Permit 216 where a small but definite anomaly is suggested with some correlation of other anomalies.

Cobalt distribution in sediments consists of three populations: A normally distributed "background" population of 78% of samples (with a mean of 3.5 ppm and "mean plus 2s" of about 8.5 ppm of Co). The other two populations are logarithmic. One consists of 19% of samples, with a mean of 12 ppm and "mean plus 2s" of 20 ppm Co. It is possibly or probably anomalous, particularly where there is correlation with other anomalies, ie. uranium. The last population (3% of total) has a mean of 27.5 ppm Co and is considered to be definitely anomalous. A number of anomalous values occur as "spot highs" (single values), others consist of groups of 2-3 values. The most interesting anomaly appears in north-central part of Permit 216, consisting of seven values ranging from 24 to 30 ppm Co - a well defined group located near the assumed edge of the Athabasca Formation. It is about a mile or two south of the three-sample Cobalt anomaly in water mentioned previously. It correlates well with similar copper and nickel anomalies in sediments. Some uranium anomalies do not correlate directly but are nearby. This grouping of various anomalies here appears to look interesting enough to warrant follow-up work, including prospecting, geochemistry and geophysics (none has been done here so far).

Muskeg Sampling

During late summer 1976, 149 organic samples were collected around the edges of several muskeg-swamps on Permits 215 and 216. This sampling was primarily of orientation nature, - to see if this type of geochemical sampling "works" in the area. The method is fairly new in Canada, particularly in prospecting for uranium, but considerable use of it is made in northern U.S.S.R. and Scandinavia (reportedly with some success). It was also used in the Carswell-Cluff Lake area in Saskatchewan where the muskeg was apparently considered to be a better sampling medium than the soils. The method used by Eldorado was somewhat similar to the method used at Cluff Lake:

Samples were taken with a soil auger at about 300 metre intervals (about 1000') along the edges of muskegs and/or swamps, and about 50 metres (150') inside from the edge of the swamp. Sample depth varied from about 0.3 to 1.0 metres. Where possible the "interface" between the glacial overburden (mostly sand) and the peat was sampled, which usually consisted of the brown decomposed peat, black "muck" (humus) and some sand, mixed together. The organic content averaged 80-100%, sometimes lower (40-60%). Taking straight peat samples was avoided. In the lab the samples were analysed for U, Cu, Ni and Co, using standard soil analytical methods (without ashing the sample).

The results, particularly for uranium, look interesting, but it is probably too early, without further work, to draw any fast conclusions. However, the following observations can be made:

Uranium, in apparently anomalous amounts, appears in a large number of samples. From the distribution histogram

the background appears to be in the 0.4 to 0.7 ppm U range, and the samples containing more than 1.0-1.2 ppm U are probably on the anomalous side of the "threshold". About 30% of samples have more than 1.2 ppm U. This high figure probably reflects the generally anomalous nature of the sampled areas; probably more than one geochemical population is present.

Copper appears to have an average background of 4 (± 1) ppm, with a threshold of 6-7 ppm Cu (from histogram). About 10% of samples have 8 ppm or more Cu - considered to be anomalous. High copper values correlate with high uranium values, although many high uranium values have no corresponding high Cu (nor Ni or Co) values.

Nickel appears to have an average background of 4 ppm, with a threshold of 6 (±) ppm Ni (from histogram). About 10% of samples have 7 ppm or more Ni - considered to be anomalous. The nickel "highs" also correlate well with uranium highs, similar to copper.

Cobalt appears to have an average background of 2 ppm, with a threshold of about 4 ppm Co (from histogram). About 6% of samples have 5 ppm or more Co - considered to be anomalous. These cobalt "highs" also correlate with high uranium values.

From the foregoing it appears that the most interesting uranium "highs" are those that correlate best with Cu, Ni and Co. More statistical work is required, on a larger number of samples, to establish all the statistical parameters regarding distribution and correlation.

Scintillometer readings were also taken at each sample site, one at "waist height", the other at ground level,

using a "total count" SPP2 Saphymo-Stel instrument. Obviously the thick muskeg (peat) is not conductive to a successful radiometric survey. Hence most of the readings were in the "low background" range, about 15 (± 5) c.p.s. However, in several locations (sample sites #50, 60, 67, 92, 99 and 101) angular granitic boulders were reported on surface, or boulders were encountered at depth with auger; these locations gave readings in 25-40 c.p.s. range. Some of these granite and boulder occurences also had samples with high uranium content.

The foregoing suggests that high metal values (including uranium) occured where the bedrock appeared to be close to the surface.

"Hound-dogging"
(Helicopter-borne radiometric prospecting.)

A Saphymo-Stel SPP2 scint, connected to a large external sensor and earphones was used in a helicopter in an attempt to locate radioactive (i.e. uranium mineralized) boulders in two geochemical anomaly areas. One area was south of Richardson River and east of Dog Lake, on Permits 216, 217 and 218; the other area was in the northern part of Permit 215. Both areas contained a number of ponds and small lakes with high uranium, etc., values in water and sediments.

A number of "kicks"were registered in the first area, which were then followed up by ground radiometric prospecting. Invariably these "kicks" appeared to be caused by numerous granitic boulders found laying along the high moraine ridges and hills in the southern part of this area.

The results from the second area were negative - except

for some topographic effect. (The boulders there are almost exclusively barren Athabasca sandstone.)

Mapping of Granitic Outcrops

All known outcrops (each one granitic or granitic gneiss) were mapped by R.D. Cruickshank, geologist, during 1976; these are all located on Permits 215, 216, 217 and 218, or immediately outside of permits. (No outcrops are known on the remaining four permits.)

The main outcrop areas are:

a) Marguerite River (mostly south of) Area, mapped by J.D. Godfrey, Alberta Research Council, 1969, and prospected by Eldorado during Summer 1975. Only the extreme northern-most outcrops, - a few small scattered outcrops, were mapped by Eldorado here.

b) Dog Lake Area; the outcrops are smaller than on Godfrey's map.

c) Richardson River Area, particularly centre part of Permit 215; a few scattered granitic outcrops occur also in the river downstream from here, including the area of numerous large angular granitic boulders (subcrop area) along the western boundary of Permit 216.

d) A small area just west of the northern-most end of Permit 217.

e) Two isolated outcrops just outside and N.E. of Permit 216 (and due east of d) above).

The main rock types in Marguerite River, Dog Lake and Richardson River (on Permit 215) areas are granite gneisses,

with some quartz-monzonite gneiss. The area of d) above consists of several outcrops of mixed gneisses, complexly folded. The directions of foliation vary from predominantly N.E. direction just north of Marguerite River to more N.W. to westerly trends in the remaining areas. Granite and pegmatite dikes occur in most areas.

Generally, these outcrops are too infrequent and limited in size to permit any geological interpolation of regional rock type boundaries between these areas.

Air-photo Study of Surficial Geology

An air-photo study was carried out by Mr. Tony Baxter during August, 1976 of the Permits 214 to 218 area. The map has not been completed hence only the descriptive report by Baxter is presented below:

General

"The area is characterized by a wide variety of landforms, the majority owing their origins to glacial and glaciofluvial processes. Moraines comprise the largest portion of glacially derived landforms in the area. Several types of moraine are recognized: end moraines, ground moraines, and disintegration moraines. Ground moraines are further subdivided on the basis of the amount and nature of the relief on their surface, into low relief ground moraine; hummocky, high relief ground moraine; and fluted and drumlinized ground moraine.

There are also extensive areas of outwash, or glaciofluvial deposits. Numerous eskers are also present, as are a few alluvial fans and one possible delta.

Much lacustrine sediment carpets the area, often characterized by well-developed solifluction streams and rills. Some prominent and extensive bluffs in the area are probably the result of wave action in the proglacial lakes that were responsible for the lacustrine deposits.

The geomorphology of the area is further complicated by the past and present operation of the wind on the expanses of outwash sand and ground moraines. Large, strikingly prominent transverse sand dunes can be seen in the area, as can many parabolic dunes.

Of course, recent fluvial activity has reworked glacial-glaciofluvial sediments, particularly in the channels of the Richardson and Maybelle Rivers.

Chronology of Glacial Events in Area - Tentative and Relative

The area was overriden by an ice sheet at least twice. No evidence could be found on the air photos to give the direction of advance of the earlier ice sheet(s). The presence of drumlinized and fluted ground moraines does indicate that there was at least two advances in the area. The latest glacial sheet must have temporarily halted in its retreat with the ice front in the area, as a pattern of arcuate end moraines (probably recessional) and a radiating pattern of glacial fluting indicates that a lobe of the retreating glacier was stationary over the Dog Lake and Muddy Lake vicinities. The general direction of ice movement of the latest ice sheet was S.S.W., judging from the orientation of fluting and drumlins (and supported by glacial striæ orientation on outcrops in the area - see map by Douglas Cruickshank, 1976.

As the ice continued to retreat, large proglacial lakes developed, particularly in the southern portion of the study area. Extensive well-defined wave-cut bluffs mark the former shorelines of these lakes (or lake?). The lakes largely drained away, probably to the west of the Athabasca River, leaving an area of extensive gullying and erosion. Immediately following the retreat of the ice, the prevailing wind direction was from 240°. This is supported by the orientation of the large transverse sand dunes in the north-western portion of the study area. The prevailing wind direction subsequently changed to from 150°. The evidence for this conclusion is the orientation of the parabolic sand dunes. The formation of the parabolic dunes must post-date the formation of the transverse dunes, as some parabolic dunes are superimposed on transverse sand dunes; some of the transverse sand dunes appear to have suffered modification by the wind shift; also, as transverse dunes are typical of areas with very little or no vegetation and parabolic dunes form in areas with enough vegetation to anchor the sand, the two types of sand dunes would represent the shift in climatic conditions from arctic to sub-arctic. Poor drainage still characterizes the area, with many swampy lakes slowly draining away, and many ill-defined swampy streams.

End Moraines

Much of the overburden of the area is comprised of end moraine complexes. Particularly well developed are those found immediately south of Dog Lake, and northeast of Muddy Lake. They are characterized by their great relief (in comparison to the other features in the area), extreme variation in the size and shape of the debris, and a series of concentric arcuate ridge-like mounds. They mark the position of the terminus of the ice sheet during a halt in its retreat or advance. It is felt by the writer that most end moraines identified as such on the map were formed

during the retreat of the glacier as they are too well defined to have been overridden by an advancing glacier. They should perhaps be more correctly termed recessional moraines.

Ground Moraines

Large portions of the area are covered with ground moraines of several types. Some ground moraines have corrugations on their surface, trending transverse to the direction of ice advance. Some ground moraines have a mantling of ablation till, giving rise to a more pronounced drift. Most of the ground moraine has very little relief. Some has been overridden by a later ice sheet, imparting a fluted and drumlinized pattern.

Disintegration Moraines

Hummocky, high-relief chaotic piles of glacial drift can be found in many parts of the study area. Often, these disintegration moraines overlap and grade into end moraines and ground moraines. Many kettle lakes are present on their surface.

Glacio-fluvial Deposits

There are numerous eskers present in the area. They appear to be most numerous in the eastern portion of the study area. Some esker complexes in that area appear as radiating fans. There is also a delta-like land form just south of Cranberry Lake.

Lacustrine Deposits

Low, flat-lying lacustrine deposits, covered at present

by muskeg, can be seen in the area. They are often areas of active solifluction. Many apparently wave-cut bluffs exist (e.g., a very long rampart south of Dog Lake bordering the huge area of Lacustrine sediments in the south, and another prominent example in the western portion of Permit 215.).

Aeólian Deposits

Immediately after deglaciation, prevailing southwesterly winds created well-defined, extensive transverse sand dunes, at right angles to the wind direction. They display a strongly asymmetric profile, with a gentle windward slope, and a steep lee slope. They reach lengths of up to 16 km in the study area.

A wind shift to the southeast modified the slope of some of the sand dunes, creating a zig-zag effect. The moderation of the climate attendant upon the shrinkage of the ice sheet allowed a greater abundance of vegetation in the area. Parabolic, or blow-out, dunes then formed under the influence of the new wind regime.

Conclusions

Geochemical exploration in this area must take into consideration the varied provenance of material in the wide variety of surficial features in this area. The overburden is likely to be very thick, in excess of 100 m."

Linecutting (grid)

About 100 line miles (= 161 km) of grid-lines were cut during 1976; of this 29.2 miles (= 47 km) were 5' wide base lines and 70.9 miles (= 114 km) were 2' wide picket lines. All were surveyed and chained (with pickets at 50 metre intervals). The picket lines were generally cut at 0.5 km intervals, base lines at 2 km intervals; these lines form a control grid on Permits 215 to 218, over the two largest lake-geochemical anomalies. All grid coordinates are metric, i.e. in tenths of kilometres.

Soil Sampling of A_o Horizon (on grid)

About 3020 A_o horizon (top humus layer) soil samples were taken over the above grid area, at 50 metre intervals. the -80 mesh fractions were analysed by Bondar-Clegg laboratory (in Ottawa) for uranium (fluorometrically) and for copper, nickel and cobalt (by atomic absorption method).

The laboratory results are generally very low, which is not surprising considering the excessive thickness of glacial or glaciofluvial overburden (sand) in the grid area. Furthermore, the A_o horizon is usually very poorly developed, so that the humus layer is very thin (less than 1 inch thick) and mixed with sand; in most areas it has been destroyed by forest fires some time ago. The few high (anomalous) values present cannot be correlated with those on the neighbouring lines due to present large line intervals. The statistical treatment and correlation of data remains to be done.

In case of uranium, about 850 samples (or about 30% of total) have "non-detectable" amounts of uranium, plotted as zero values. About 85% of samples contain less than 0.4 ppm U. Samples containing more than 1.0 to 1.2 ppm U are probably anomalous (from histogram).

(Calculations of statistical parameters are not completed.)

Resistivity Surveys (on grid)

A reconnaissance type Resistivity Survey, done by a contractor, was carried out on nine lines, totalling about 15 line miles (= 24 km). Dipole intervals were 50 metres (164'), and two Wenner arrays were also run for depth determinations.

Following is brief description of each line surveyed:

1) Line 7E: from 5.25N to 7.30N (see graph 1)

The resistivity reflects mainly overburden conditions. The higher resistivity between 5.2N and 6.0N relates to the end moraine ridges while the lower resistivity to the north may reflect the muskeg and more water-saturated sand plains, eg. from 6.1N to 6.25N, near a pond. The dome-shaped resistivity "high" between 6.15N and 6.75N may indicate granitic basement which outcrop in this area, both sides of line.

2) Line 8.5E: from 6.1N to 7.3N (see graph 1)

Again, the resistivity reflects largely overburden, which may be deep. The higher readings at depth (6.45N and 6.65N) may indicate granitic basement. Surface "lows" seem to indicate swamps and ponds, or valleys. (DDH #508-15, which encountered weathered granitic gneisses @ 170' (about 55 metres) depth, is located on a sandy ridge about 200m east of 6.2N)

3) Base Line 10E: from 5.15N to 7.9N (see graph 2)

From 5.85N to end of line @ 8.0N the conditions are similar to line 8.5E above: gently rolling sand hills,

or sand flats toward the river. The generally low resistivity, increasing with depth, may reflect deep overburden (probably with relatively shallow water table). The high inverted resistivity (high readings near top) in the line section 5.85N to 5.15N may reflect the high end moraine ridges there. The cause of the high resistivity between 5.65N and 5.7N is not known.

4) Line 11E: from 5.05N to 8.0N (see graph 2)

The relatively low surface resistivity from 5.75N to about 7.45N again occurs in the area of sand plains. The increased resistivity at depth, from 6.25N to 6.85N and from 7.10N to 7.15N may indicate basement granites. DDH #508-2 encountered silicified and altered basement granite at 90' (about 30m) depth about 400m east of 6.5N. The greatly increasing with depth resistivity near river, from 7.45N to 8.0N may indicate bedrock. The south end of the line, from 5.75N to 5.1N is on the end moraine hills.

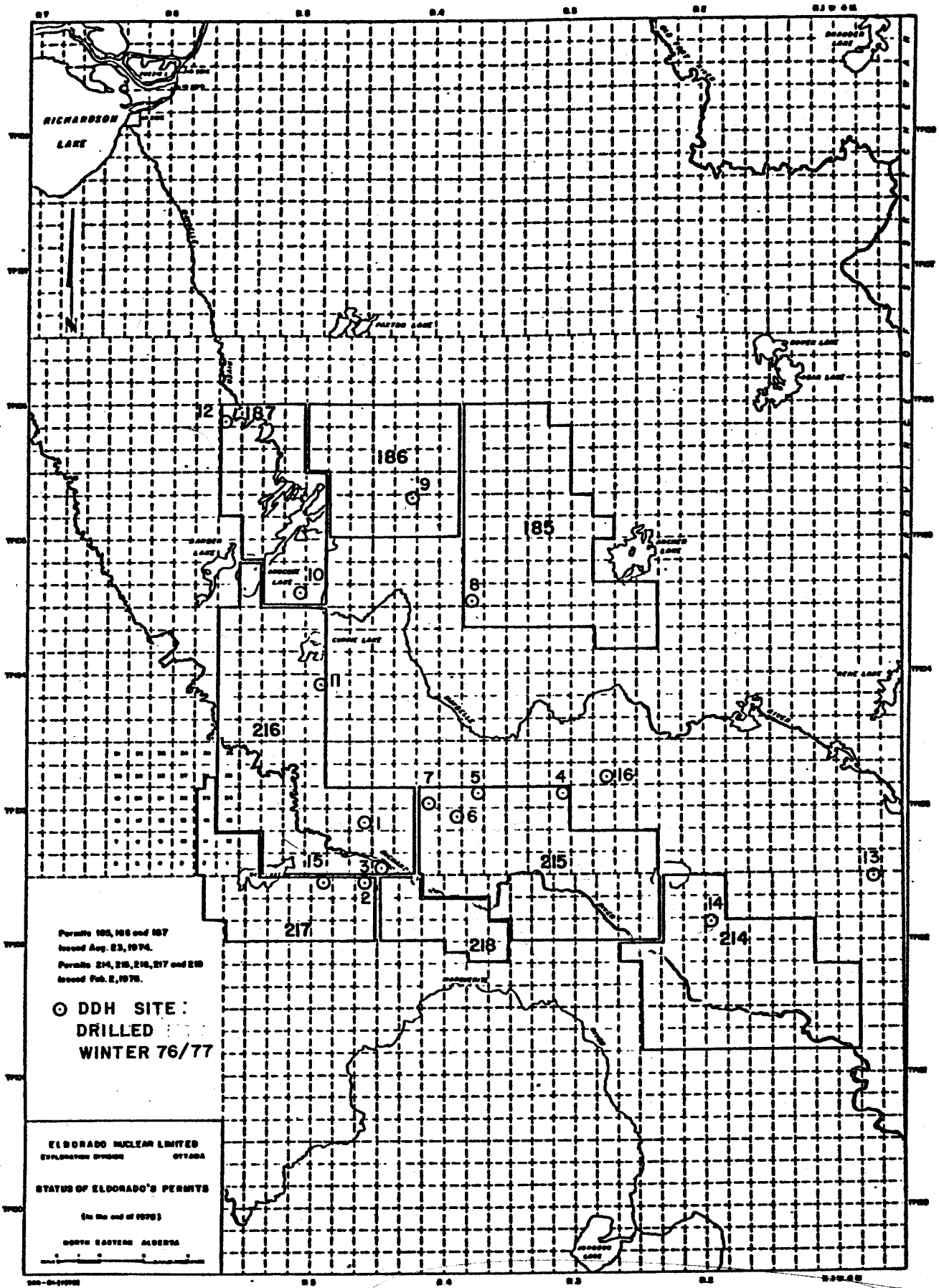
5) Line 13E: from 5.15N to 7.6N (see graph 3)

The resistivity is generally higher on this line than on the previous lines. The greater surface resistivity from 6.35N to 5.15N (toward south) is in the area of high end moraine with ridges and valleys. The remaining area to the north, 6.35N to 7.65N is on flat sand plains; the low surface resistivity near the north end of the line may be related to low, swampy ground. DDH #508-3, which encountered basement schist and gneiss @ 60' (about 30m) depth is located 0.5 km to west from about 7.2N.

6) Base Line 20E: from 4.1N to 12.4N (see graph 5)

This is the longest N-S line on which resistivity was run. It is expected to cross the edge of the Athabasca sandstone toward its north end. Several granite outcrops

19770004 FIGURE 5



LOCATIONS OF DIAMOND DRILL HOLES 508-1 TO 508-11, DRILLED IN NOV.-DEC., 1976.
AND 508-12 TO 508-16, DRILLED IN FEB. 1977.

25-26 #214
27-29 #217
17-20 #216
22 214
} 1978

17-22 - March/78
23-29 - April/78

occur near 5.30N and 5.35N, interspersed with small swamps; this is reflected in the local resistivity highs in this area. The ground rises from 5.40N toward north. Two inverted (surface) resistivity highs occur from 8.85N to 8.35N and 11.5N to 11.8N. The low resistivity toward the north end of the line is related to muskeg near the lake. The very high resistivity occuring between 5.90N and 6.9N is unexplained.

7) Line 21.5E: from 10.1N to 12.2N (see graph 4)

The generally low resistivity indicates deep overburden, probably waterlogged. Occasional inverted (surface) high resistivity may indicate ridges & hill tops. Marshy, shallow ponds occur on both sides of the line.

8) Base Line 10N: from 18.2E to 21.7E (see graph 3)

This West to East line is in the rather flat to gently rolling and mainly sand covered country. The generally very low resistivity here appears to be related to the deep glacial overburden. The inverted high resistivity (high reading near surface) between 21.30E and 21.7E occur south of a shallow marshy pond; its significance is not known. The Athabasca sandstone edge is expected to be in this area, or just north of the line. With the possible exception of the above inverted high resistivity, there is no indication that this edge is crossed on this line.

9) Base Line 12N: from 19.75E to 21.70E (see graph 4)

Not much change in resistivity occurshere; it is generally low, again indicating deep, probably waterlogged, overburden. Some inverted "highs" may be related to ridges and hill tops. The country is largely flat.

10) Wenner Arrays: Line 9E - @ 6N; Line 21E - @ 10.65N (see graph 6)

Data indicates shallow high resistivity zone @ surface. More correlation from other sources is needed for interpretation

Diamond Drilling, Winter 1976-1977
(D.D.H.'s No's 508-1 to 508-16)

Sixteen (16) BQ size diamond drill holes were drilled during the 1976-1977 Winter Drilling Program in the Project 508 area, totalling 5,364 feet. Eleven holes were drilled during November-December, 1976, (total 3,494 feet) and five holes during February, 1977 (total 1,870 feet). Of these, five holes were abandoned before reaching the desired depth in bedrock, due to caving and the drill-rods getting stuck. All holes are vertical. The drilling was carried out by Coates Enterprises Limited, Vancouver, British Columbia. A Bell 205A helicopter (Klondike Helicopters, Calgary, Alberta) was used to move the drill and the crew. The core is stored at Eldorado's Base Camp.

Following is the summarized drill hole data:

1) DDH #508-1, completed November 13, 1976.
Location: Permit 216; Twp. 103-R.5, Section 13 (centre)
Depth: 227 feet
0' - 130': Overburden
130' - 227': Fresh basement gneisses

2) DDH #508-2, completed November 17, 1976.
Location: Permit 217; Twp. 102-R.5, Section 36/NW
Depth: 591' feet
0' - 90': Overburden
90' - 90.5': Athabasca Formation sandstone (may be a boulder)
90.5'- 591': Altered, strongly silicified, hematized, sheared basement gneisses

3) DDH #508-3, completed November 19, 1976.
Location: Permit 215; Twp. 103-R.4, Section 6/SW
Depth: 187 feet

0'	- 60'	: Overburden
60'	- 60.5'	: Athabasca Formation sandstone (may be a boulder)
60.5'	- 187'	: Altered and brecciated basement gneisses

4) DDH# 508-4, abandoned November 22, 1976.
Location: Permit 215; Twp. 103-R.3, Section 21/NE
Depth: 167 feet

0'	- 164'	: Overburden
164'	- 167'	: Athabasca Formation sandstone (probably boulders)

(The hole was abandoned due to rig sinking into muskeg.)

5) DDH #508-5, completed November 24, 1976.
Location: Permit 215; Twp. 103-R.4, Section 23/NE
Depth: 387 feet

0'	- 104.6'	: Overburden
104.6'	- 256'	: Post-Athabasca (Devonian) sediments; fossiliferous limestone, as well as limy mudstone and sandstone
256'	- 266'	: Athabasca Formation sandstone and thin basal conglomerate.
266'	- 380'	: Altered basement gneisses (regolith)
380'	- 387'	: Fresh basement gneisses

6) DDH #508-6, completed November 26, 1976.
Location: Permit 215; Twp. 103-R.4, Section 15/NE
Depth: 346 feet

0' - 161':	Overburden
161' - 262':	Post-Athabasca (Devonian) sediments; limy mudstone, sandstone and basal breccia
262' - 323':	Athabasca Formation sandstone and thin basal conglomerate
323' - 346':	Altered basement gneisses (regolith)

7) DDH #508-7, completed November 27, 1976.
Location: Permit 215; Twp. 103-R.4, Section 21/SW
Depth: 194 feet

0' - 76':	Overburden
76' - 111':	Post-Athabasca (Devonian) sediments; limy mudstone, sandstone and basal breccia
111' - 194':	Altered basement gneisses (regolith)

8) DDH #508-8, abandoned November 30, 1976.
Location: Permit 185; Twp. 105-R.4, Section 2/SW
Depth: 187 feet

0' - 45':	Overburden
45' - 187':	Post-Athabasca (Devonian) sediments; mainly limestone and limy sandstone

(The hole was abandoned due to poor drilling conditions - broken rods, lost core barrel.)

9) DDH #508-9, completed December 4, 1976.
Location: Permit 186; Twp. 105-R.4, Section 29/NE
Depth: 597 feet

0'	- 91'	: Overburden
91'	- 109'	: Post-Athabasca (Devonian) sediments; sandstone with mudstone
109'	- 437.5'	: Athabasca Formation sandstone; partly bituminous; thin basal conglomerate
437.5'	- 597'	: Altered, partly silicified basement gneisses (regolith) fresher at bottom

(Part of the hole was probed radiometrically; no significant anomalous radioactivity.)

10) DDH #508-10, abandoned December 7, 1976.
Location: Permit 187; Twp. 105-R.5, Section 4/NE-SE
Depth: 387 feet

0'	- 121'	: Overburden
121'	- 275.5'	: Post-Athabasca (Devonian) sediments; argillaceous limestone, mudstone and sandstone
275.5'	- 387'	: Athabasca Formation sandstone

(Abandoned due to sand cave-in; rods and core-barrel lost in hole.)

11) DDH #508-11, abandoned December 11, 1976.
Location: Permit 216; Twp. 104-R.5, Section 15/SE
Depth: 224 feet (all in overburden - sand)
(Abandoned due to shortage of casings.)

12) DDH #508-12, completed February 12, 1977.
Location: Permit 187; Twp. 106-R.6, Section 13/SW
Depth: 368 feet
0' - 66': Overburden
66' - 368': Athabasca Formation sandstone

13) DDH #508-13, abandoned February 15, 1977.
Location: NE of Permit 214; TWP. 102-R.1, Section 35/NE
Depth: 218 feet
0' - 120': Overburden
120' - 218': Muddy calcareous Post-Athabasca (Devonian) sandstone. Core recovery 40%.
(Hole abandoned due to poor ground; casing broken and lost in the hole.)

14) DDH #508-14, completed February , 1977.
Location: Permit 214; Twp. 102-R.2, Section 22/NW
Depth: 478 feet
0' - 196': Overburden
196' - 222': Post-Athabasca (Devonian) sediments; mudstone and sandstone
222' - 383': Athabasca Formation sandstone; becomes layered and banded @ depth, grades into next section.
383' - 419': Red mudstone (transported regolith); grades into next section
419' - 433': Pre-Athabasca regolith
433' - 475': Altered Pre-cambrian basement gneiss
475' - 478': Unaltered basement gneiss
(The hole was probed with a gamma-ray probe)

15) DDH #508-15, completed February 20, 1977.
Location: Permit 217; Twp. 102-R.5, Section 34/NE
Depth: 238 feet
0' - 170': Overburden
170' - 238': Precambrian basement gneisses and granite. Clay alteration strongest toward top.
(Casing lost in hole.)

16) DDH #508-16, completed February 24, 1977.
Location: N of Permit 215; Twp. 103-R.3, Section 26/SE
Depth: 568 feet
0' - 110': Overburden
110' - 568': Athabasca Formation sandstone; partly bituminous ("dead oil stain")

V. EXPENDITURES

(see following tables)

a) Summary of Expenditures for the Period of January 1, 1974 to December 31, 1976.

b) Cost Summary/Cost Statement, December, 1976 (final computer sheets for 1976)

ALBERTA PERMITS PROJECT NO. 508

For the period January 1, 1974 to December 31, 1976

	1974	1975	NB 1976	Total
Administration	-	9,194	3,864	13,058
Recruit and relocate personnel	-	1,226	1,706	2,932
Meetings conference convention	-	-	2,118	2,118
Property acquisition	1,875	9,335	-	11,210
Property examination	-	33	192	225
Drafting and clerical	-	3,336	7,192	10,528
Air borne survey	83	7,139	-	7,222
Surveying	-	-	6	6
Report writing	-	-	2,278	2,278
Public relations and goodwill	-	-	62	62
Geological general	-	-	3,422	3,422
Geological mapping	-	15,964	18,341	34,305
Prospecting	-	6,018	3,802	9,820
Research	-	1,625	-	1,625
Geological research	-	-	1,708	1,708
Lake sediment sampling	99	14,776	-	14,875
Water analysis	-	12,587	-	12,587
Diamond drilling	-	-	176,625	176,625
Geophysical: radiometric	-	-	3,181	3,181
: VLF electromagnetic	-	-	465	465
: bore hole survey	-	-	1,345	1,345
: hound dogging *	-	-	3,022	3,022
: resistivity	-	-	11,412	11,412
: ground	-	7,161	-	7,161
Geochemical: ground	127	10,539	-	10,666
: soil	-	-	26,062	26,062
: emanometry	-	-	28	28
: sediment	-	-	7,592	7,592
: water	-	-	9,192	9,192
: rock	-	-	26	26
: research	-	-	1,305	1,305
Field transportation	-	8,004	-	8,004
Camp operation	-	39,249	-	39,249
Freighting supplies	-	8,144	-	8,144
Project: supervision	3,258	27,195	17,327	47,780
:personnel support	-	-	63,231	63,231
Disposition maintenance	-	-	13,546	13,546
Disposition aquisition	-	-	56	56
Line cutting	-	-	36,652	36,652
	5,442	181,525	415,758	602,725

The statement of expenditures listed above were extracted from the records of Eldorado Nuclear and were prepared by:

[redacted]

J. B. Kelly,
Chief Accountant

* helicopter-borne radiometric prospecting

H.C.

EXPLORATION DIVISION

COST SUMMARY BY PROJECT
DECEMBER 1976

PROJECT NO. 508

CURRENT MONTH ACTUAL	CURRENT MONTH BUDGET	CURRENT MONTH VARIANCE		YEAR TO DATE ACTUAL	YEAR TO DATE BUDGET	YEAR TO DATE VARIANCE
14,439	3,153	11,286*	SALARIES	72,285	86,845	14,560
2,416	347	2,069*	BURDEN ON SALARIES	8,779	9,555	776
32,398		32,398*	GENERAL SUPPLIES	33,904	1,350	32,554*
13,072		13,072*	FUELS	13,927	1,000	12,927*
47,158		47,158*	CONTRACTOR	66,268	211,200	144,932
			TOOLS		300	300
3,256		3,256*	TRAVEL	5,588		5,588*
			TELECOMMUNICATIONS	29		29*
	330	330	ACCOUNTING SERVICES		3,850	3,850
50		50*	TAXES, GROUND RENTS, LEASES	13,570	15,000	1,430
			REFUNDABLE DEPOSITS		10,000	10,000
			FOOD & MEALS	7,998	12,000	4,002
			CAMP SUPPLIES	4,391	1,000	3,391*
53,517		53,517*	HELICOPTER	103,374	43,000	60,374*
5,821		5,821*	FIXED WING AIRCRAFT	48,632	15,000	33,632*
			TRAVEL FARES	1,408	10,900	9,492
			OTHER TRANSPORTATION	106		106*
203,702CR	1,915CR	201,787	RECOVERED COSTS	303,702CR	309,583CR	5,881*
			PUBLICATIONS & MAPS	346		346*

EXPLORATION DIVISION

COST SUMMARY BY PROJECT

DECEMBER 1976

CURRENT MONTH ACTUAL	CURRENT MONTH BUDGET	CURRENT MONTH VARIANCE	PROJECT NO. 508	YEAR TO DATE ACTUAL	YEAR TO DATE BUDGET	YEAR TO DATE VARIANCE
5		5*	OFFICE SUPPLIES	104	80	24*
			INSTRUMENTS	70	130	60
			EQUIPMENT RENTAL	2,745		2,745*
3,022		3,022*	INSTRUMENT RENTAL	9,038	3,500	5,538*
			LABORATORY ANALYSIS	20,349	18,000	2,349*
2		2*	EQUIPMENT MAINTENANCE	112		112*
17		17*	INSTRUMENT MAINTENANCE	17	1,090	1,073
382		382*	SHIPPING CHARGES	2,071	2,350	279
			MAINTENANCE LABOUR	644		644*
28,147CR	1,915	30,062	PROJECT TOTALS	112,053	136,567	24,514

EXPLORATION DIVISION

COST STATEMENT
DECEMBER 1976

CURRENT MONTH ACTUAL	BUDGET	VARIANCE	PROJECT NO. 508	YEAR TO DATE ACTUAL	BUDGET	VARIANCE
			01 ADMINISTRATION			
392	811	419	111 SALARIES	2,785	9,732	6,947
71	89	18	118 BURDEN ON SALARIES	334	1,068	734
			121 GENERAL SUPPLIES	15		15*
139		139*	133 TRAVEL	170		170*
			134 TELECOMMUNICATIONS	8		8*
	330	330	141 ACCOUNTING SERVICES		3,850	3,850
			151 TAXES, GROUND RENTS, LEASES	50		50*
			161 FOOD & MEALS	10		10*
			173 TRAVEL FARES	492	1,400	908
			198 SHIPPING CHARGES		100	100
602	1,230	628	TOTAL ADMINISTRATION	3,864	16,150	12,286
			02 RECRUIT & RELOCATE PERSONNEL			
45		45*	111 SALARIES	632		632*
11		11*	118 BURDEN ON SALARIES	76		76*
			133 TRAVEL	288		288*
			134 TELECOMMUNICATIONS	10		10*
			173 TRAVEL FARES	700		700*
56		56*	TOTAL RECRUIT & RELOCATE PERSONNEL	1,706		1,706*
			05 MEETINGS CONFERENCE CONVENTION			
607		607*	111 SALARIES	824		824*
75		75*	118 BURDEN ON SALARIES	99		99*
802		802*	133 TRAVEL	1,195		1,195*
1,484		1,484*	TOTAL MEETINGS CONFERENCE CONVENTION	2,118		2,118*
			06 PROPERTY EXAMINATION			
134		134*	111 SALARIES	169		169*
16		16*	118 BURDEN ON SALARIES	20		20*
			189 PUBLICATIONS & MAPS	3		3*
150		150*	TOTAL PROPERTY EXAMINATION	192		192*
			07 DRAFTING & CLERICAL			
2,271	360	1,911*	111 SALARIES	5,915	4,320	1,595*
309	40	269*	118 BURDEN ON SALARIES	710	480	230*
			128 CONTRACTOR	341		341*

EXPLORATION DIVISION

COST STATEMENT

DECEMBER 1976

CURRENT MONTH ACTUAL	CURRENT MONTH BUDGET	CURRENT MONTH VARIANCE	PROJECT NO. 508	YEAR TO DATE ACTUAL	YEAR TO DATE BUDGET	YEAR TO DATE VARIANCE
			07 DRAFTING & CLERICAL			
			190 OFFICE SUPPLIES	83	60	23*
			191 INSTRUMENTS	70	80	10
2,580	400	2,180*	198 SHIPPING CHARGES	73	60	13*
			TOTAL DRAFTING & CLERICAL	7,192	5,000	2,192*
			08 SURVEYING			
			134 TELECOMMUNICATIONS	6		6*
			193 INSTRUMENT RENTAL			
			TOTAL SURVEYING	6		6*
			09 REPORT WRITING			
667		667*	111 SALARIES	2,034		2,034*
94		94*	118 BURDEN ON SALARIES	244		244*
761		761*	TOTAL REPORT WRITING	2,278		2,278*
			10 PUBLIC RELATIONS & GOODWILL			
			133 TRAVEL	62		62*
			TOTAL PUBLIC RELATIONS & GOODWILL	62		62*
			20 GEOLOGICAL GENERAL			
88		88*	111 SALARIES	899		899*
19		19*	118 BURDEN ON SALARIES	108		108*
			121 GENERAL SUPPLIES			
			128 CONTRACTOR	883		883*
310		310*	133 TRAVEL	310		310*
			171 HELICOPTER	883		883*
			189 PUBLICATIONS & MAPS	312		312*
			198 SHIPPING CHARGES	27		27*
417		417*	TOTAL GEOLOGICAL GENERAL	3,422		3,422*
			22 GEOLOGICAL MAPPING			
373		373*	111 SALARIES	5,271	8,109	2,838
94		94*	118 BURDEN ON SALARIES	633	891	258
			121 GENERAL SUPPLIES	217	100	117*
			171 HELICOPTER	12,193	8,000	4,193*
			173 TRAVEL FARES		400	400

EXPLORATION DIVISION

COST STATEMENT
DECEMBER 1976

CURRENT MONTH ACTUAL	BUDGET	VARIANCE	PROJECT NO. 508	YEAR TO DATE ACTUAL	BUDGET	VARIANCE
			22 GEOLOGICAL MAPPING			
			190 OFFICE SUPPLIES		20	20
			191 INSTRUMENTS		50	50
			193 INSTRUMENT RENTAL		150	150
			197 INSTRUMENT MAINTENANCE		40	40
			198 SHIPPING CHARGES	27	40	13
467		467*	TOTAL GEOLOGICAL MAPPING	18,341	17,800	541*
			23 PROSPECTING			
86		86*	111 SALARIES	1,216	7,208	5,992
22		22*	118 BURDEN ON SALARIES	146	792	646
			121 GENERAL SUPPLIES	464	50	414*
			129 TOOLS		100	100
			171 HELICOPTER	1,221	6,000	4,779
			173 TRAVEL FARES		400	400
			190 OFFICE SUPPLIES	3		3*
			192 EQUIPMENT RENTAL	752		752*
			193 INSTRUMENT RENTAL		900	900
			198 SHIPPING CHARGES		50	50
108		108*	TOTAL PROSPECTING	3,802	15,500	11,698
			24 GEOLOGICAL RESEARCH			
102	450	348	111 SALARIES	1,433	4,500	3,067
26	50	24	118 BURDEN ON SALARIES	172	500	328
			173 TRAVEL FARES	69		69*
			189 PUBLICATIONS & MAPS	21		21*
			190 OFFICE SUPPLIES	13		13*
128	500	372	TOTAL GEOLOGICAL RESEARCH	1,708	5,000	3,292
			26 DIAMOND DRILLING			
5,117		5,117*	111 SALARIES	7,517	900	6,617*
638		638*	118 BURDEN ON SALARIES	902	100	802*
32,398		32,398*	121 GENERAL SUPPLIES	32,577		32,577*
13,072		13,072*	125 FUELS	13,072		13,072*
47,158		47,158*	128 CONTRACTOR	47,158	100,000	52,842
1,695		1,695*	133 TRAVEL	1,695		1,695*
53,517		53,517*	171 HELICOPTER	53,517		53,517*

EXPLORATION DIVISION

COST STATEMENT
DECEMBER 1976

CURRENT MONTH ACTUAL	BUDGET	VARIANCE	PROJECT NO. 508	YEAR TO DATE ACTUAL	BUDGET	VARIANCE
			26 DIAMOND DRILLING			
5,821		5,821*	172 FIXED WING AIRCRAFT	18,273		18,273*
5		5*	190 OFFICE SUPPLIES	5		5*
1,811		1,811*	193 INSTRUMENT RENTAL	1,811		1,811*
98		98*	198 SHIPPING CHARGES	98		98*
161,330		161,330*	TOTAL DIAMOND DRILLING	176,625	101,000	75,625*
			27 PERCUSSION DRILLING			
			111 SALARIES		900	900
			118 BURDEN ON SALARIES		100	100
			128 CONTRACTOR		50,000	50,000
			TOTAL PERCUSSION DRILLING		51,000	51,000
			30 GEOPHYSICAL RADIOMETRIC			
6		6*	111 SALARIES	78	9,010	8,932
1		1*	118 BURDEN ON SALARIES	9	990	981
			121 GENERAL SUPPLIES		100	100
			128 CONTRACTOR		20,000	20,000
			171 HELICOPTER		7,000	7,000
			173 TRAVEL FARES		800	800
901		901*	193 INSTRUMENT RENTAL	3,281	2,450	831*
			197 INSTRUMENT MAINTENANCE		50	50
			198 SHIPPING CHARGES		100	100
			219 MAINTENANCE LABOUR	187CR		187
908		908*	TOTAL GEOPHYSICAL RADIOMETRIC	3,181	40,500	37,319
			32 GEOPHYS V L F ELECTROMAGNETIC			
310		310*	193 INSTRUMENT RENTAL	465		465*
310		310*	TOTAL GEOPHYS V L F ELECTROMAGNETIC	465		465*
			33 GEOPHYSICAL AIRBORNE SURVEY			
			128 CONTRACTOR		30,000	30,000
			TOTAL GEOPHYSICAL AIRBORNE SURVEY		30,000	30,000
			34 GEOPHYSICAL BORE HOLE SURVEY			
			193 INSTRUMENT RENTAL	1,120		1,120*
273		273*	198 SHIPPING CHARGES	273		273*

EXPLORATION DIVISION

COST STATEMENT
DECEMBER 1976

CURRENT MONTH ACTUAL	BUDGET	VARIANCE	PROJECT NO. 508	YEAR TO DATE ACTUAL	BUDGET	VARIANCE
			34 GEOPHYSICAL BORE HOLE SURVEY			
			219 MAINTENANCE LABOUR	48CR		48
273		273*	TOTAL GEOPHYSICAL BORE HOLE SURVEY	1,345		1,345*
			35 GEOPHYSICAL HOUND DOGGING			
10		10*	111 SALARIES	142	3,603	3,461
3		3*	118 BURDEN ON SALARIES	17	397	380
			171 HELICOPTER	1,463	7,000	5,537
			193 INSTRUMENT RENTAL	1,400		1,400*
			197 INSTRUMENT MAINTENANCE		1,000	1,000
13		13*	TOTAL GEOPHYSICAL HOUND DOGGING	3,022	12,000	8,978
			38 GEOPHYSICAL RESISTIVITY			
92		92*	111 SALARIES	1,293		1,293*
23		23*	118 BURDEN ON SALARIES	155		155*
			121 GENERAL SUPPLIES	10		10*
			128 CONTRACTOR	5,915		5,915*
			133 TRAVEL	431		431*
			171 HELICOPTER	2,789		2,789*
			172 FIXED WING AIRCRAFT	493		493*
			198 SHIPPING CHARGES	326		326*
115		115*	TOTAL GEOPHYSICAL RESISTIVITY	11,412		11,412*
			40 GEOCHEMICAL SOIL			
321		321*	111 SALARIES	4,531	6,306	1,775
81		81*	118 BURDEN ON SALARIES	544	694	150
			121 GENERAL SUPPLIES	212	100	112*
			171 HELICOPTER	3,788	7,000	3,212
			173 TRAVEL FARES		400	400
			195 LABORATORY ANALYSIS	16,511	6,000	10,511*
			198 SHIPPING CHARGES	476	1,000	524
402		402*	TOTAL GEOCHEMICAL SOIL	26,062	21,500	4,562*
			41 GEOCHEMICAL EMANOMETRY			
			121 GENERAL SUPPLIES	28		28*
			TOTAL GEOCHEMICAL EMANOMETRY	28		28*

EXPLORATION DIVISION

COST STATEMENT
DECEMBER 1976

CURRENT MONTH ACTUAL	BUDGET	VARIANCE	PROJECT NO. 508	YEAR TO DATE ACTUAL	BUDGET	VARIANCE
			44 GEOCHEMICAL SEDIMENT			
72		72*	111 SALARIES	1,020	2,703	1,683
18		18*	118 BURDEN ON SALARIES	123	297	174
			121 GENERAL SUPPLIES	43	500	457
			171 HELICOPTER	5,245	3,000	2,245*
			173 TRAVEL FARES		800	800
			195 LABORATORY ANALYSIS	844	6,000	5,156
			198 SHIPPING CHARGES	317	500	183
90		90*	TOTAL GEOCHEMICAL SEDIMENT	7,592	13,800	6,208
			45 GEOCHEMICAL WATER			
55		55*	111 SALARIES	779	2,703	1,924
14		14*	118 BURDEN ON SALARIES	94	297	203
			121 GENERAL SUPPLIES	64	500	436
			171 HELICOPTER	5,287	3,000	2,287*
			173 TRAVEL FARES		800	800
			195 LABORATORY ANALYSIS	2,968	6,000	3,032
			198 SHIPPING CHARGES		500	500
69		69*	TOTAL GEOCHEMICAL WATER	9,192	13,800	4,608
			46 GEOCHEMICAL ROCK			
			195 LABORATORY ANALYSIS	26		26*
			TOTAL GEOCHEMICAL ROCK	26		26*
			47 GEOCHEMICAL RESEARCH			
170		170*	111 SALARIES	1,155		1,155*
30		30*	118 BURDEN ON SALARIES	139		139*
			189 PUBLICATIONS & MAPS	11		11*
200		200*	TOTAL GEOCHEMICAL RESEARCH	1,305		1,305*
			50 PROJECT SUPERVISION			
1,693	1,532	161*	111 SALARIES	11,819	18,202	6,383
349	168	181*	118 BURDEN ON SALARIES	1,463	1,998	535
			121 GENERAL SUPPLIES	40		40*
310		310*	133 TRAVEL	691		691*
			171 HELICOPTER	277	1,000	723
			172 FIXED WING AIRCRAFT	2,682		2,682*

EXPLORATION DIVISION

COST STATEMENT
DECEMBER 1976

CURRENT MONTH ACTUAL	BUDGET	VARIANCE	PROJECT NO. 508	YEAR TO DATE ACTUAL	BUDGET	VARIANCE
			50 PROJECT SUPERVISION			
			173 TRAVEL FARES	149	900	751
			198 SHIPPING CHARGES	206		206*
2,352	1,700	652*	TOTAL PROJECT SUPERVISION	17,327	22,100	4,773
			53 PROJECT PERSONNEL SUPPORT			
1,551		1,551*	111 SALARIES	15,381	8,649	6,732*
383		383*	118 BURDEN ON SALARIES	1,904	951	953*
			121 GENERAL SUPPLIES	233		233*
			125 FUELS	855	1,000	145
			129 TOOLS		200	200
			133 TRAVEL	746		746*
			161 FOOD & MEALS	7,988	12,000	4,012
			164 CAMP SUPPLIES	4,391	1,000	3,391*
			171 HELICOPTER	2,451	1,000	1,451*
			172 FIXED WING AIRCRAFT	26,729	15,000	11,729*
			173 TRAVEL FARES		4,200	4,200
			177 OTHER TRANSPORTATION	106		106*
			192 EQUIPMENT RENTAL	1,993		1,993*
560CR		560	193 INSTRUMENT RENTAL			
2		2*	196 EQUIPMENT MAINTENANCE	112		112*
12		12*	198 SHIPPING CHARGES	248		248*
			219 MAINTENANCE LABOUR	94		94*
1,388		1,388*	TOTAL PROJECT PERSONNEL SUPPORT	63,231	44,000	19,231*
			65 JOINT VENTURE REIMBURSEMENTS			
203,702CR	1,915CR	201,787	181 RECOVERED COSTS	303,702CR	309,583CR	5,881*
203,702CR	1,915CR	201,787	TOTAL JOINT VENTURE REIMBURSEMENTS	303,702CR	309,583CR	5,881*
			70 DISPOSITION MAINTENANCE			
46		46*	111 SALARIES	46		46*
6		6*	118 BURDEN ON SALARIES	6		6*
			134 TELECOMMUNICATIONS	4		4*
13,490		13,490*	151 TAXES, GROUND RENTS, LEASES	13,490	10,000	3,490*
13,542		13,542*	TOTAL DISPOSITION MAINTENANCE	13,546	10,000	3,546*
			71 ~~PROJECT SUPERVISION~~ OMIT			
13,440CR		13,440	151 TAXES, GROUND RENTS, LEASES			
13,440CR		13,440	TOTAL PROJECT SUPERVISION			

EXPLORATION DIVISION

COST STATEMENT
DECEMBER 1976

CURRENT MONTH ACTUAL	BUDGET	VARIANCE	PROJECT NO. 508	YEAR TO DATE ACTUAL	BUDGET	VARIANCE
			73 DISPOSITION ACQUISITION			
23		23*	111 SALARIES	23		23*
3		3*	118 BURDEN ON SALARIES	3		3*
			151 TAXES, GROUND RENTS, LEASES	30	5,000	4,970
			156 REFUNDABLE DEPOSITS		10,000	10,000
26		26*	TOTAL DISPOSITION ACQUISITION	56	15,000	14,944
			74 LINE CUTTING			
519		519*	111 SALARIES	7,324		7,324*
131		131*	118 BURDEN ON SALARIES	879		879*
			128 CONTRACTOR	11,972	11,200	772*
			134 TELECOMMUNICATIONS	1		1*
			171 HELICOPTER	14,259		14,259*
			172 FIXED WING AIRCRAFT	455		455*
			173 TRAVEL FARES		800	800
560		560*	193 INSTRUMENT RENTAL	960		960*
17		17*	197 INSTRUMENT MAINTENANCE	17		17*
			219 MAINTENANCE LABOUR	785		785*
1,227		1,227*	TOTAL LINE CUTTING	36,652	12,000	24,652*
28,144CR	1,915	30,059	TOTAL PROJECT 508	112,056	136,567	24,511

VI. CONCLUSIONS

1) Diamond drilling has revealed that the Permits 185, 186 and 187 (the "Northern Permits") are underlain by deep overburden (45' to 120') and excessively deep Paleozoic (Devonian) and Proterozoic (Athabasca Formation) sediments. The depth of the Precambrian basement paleosurface appears to be in excess of 400 feet, making any exploration here extremely difficult, if not impossible. (see DDH #508-8, 9, 10 and 12)

2) The lake geochemical anomalies on the above permits are either "spot highs" (erratic single sample anomalies) or too small and vague to be of much further interest. They apparently are related to glacial overburden.

3) The edge of the Athabasca sandstone is apparently located on Permits 214, 215 and 216 (the "Southern Permits"). The exact location of it could be determined only with further drilling.

4) It seems reasonable to assume that this sandstone edge is not a smooth, curved line, but may contain embayments, outliers or basement windows. This assumption is based on the information regarding the edge of the sandstone in Saskatchewan. (This aspect should be kept in mind when planning any detail exploration in the area.)

5) Parts of the "Southern Permits" (214 to 218) appear to be also covered by calcareous Devonian mudstones, sandstones, etc., forming a "capping" over the Athabasca sandstone.

It is assumed that the Devonian sediments may have protected the edge of the Athabasca sandstone where it was thin, i.e. the sandstone may not have survived the glacial action alone. (Hence the clay layer at the edge of the Devonian could be used indirectly - by geophysics - to locate the sandstone?)

6) No high radioactivity or uranium mineralization was encountered in any of the drill holes; nor has any been found in the outcrops or boulders in the permits area so far.

7) Several drill holes indicated good paleosurface conditions, i.e. weathering and regolith, favourable for uranium deposition along the unconformity. (eg. DDH #508-14, 15, etc.)

8) Significant geochemical anomalies in water and sediments occur in the "Southern Permits" area. The anomalies showing correlation between U, Cu, Ni and Co appear to be most interesting. So far, however, none of these anomalies could be related to any bedrock mineralization, nor to any mineralized boulder trains in the overburden.

9) The limited muskeg sampling revealed some high U, Cu, Ni and Co values, the significance of which remains to be studied. Further muskeg sampling, combined with ground radiometrics and boulder-prospecting in the vicinity of lake anomalies may give information regarding the origin and significance of the lake geochemical anomalies near the edge of the Athabasca sandstone.

10) Soil sampling of the A_O horizon on the grid appeared to be less successful at this stage. This could be explained by wide spacing of samples and grid-lines, thickness of overburden, presence of much glaciofluvial sand (eg. along Richardson River), and the extremely thin soil cover.

11) The reconnaissance type Resistivity Survey was done on very wide line spacings (about a mile apart). this, combined with the lack of information regarding the nature and depth of bedrock, makes interpretation uncertain at this stage.

VII. RECOMMENDATIONS

1) Relinquish Permits 185, 186 and 187 (the "Northern Permits"). This ground (or parts thereof) could be retained only by taking up leases which cost $0.25 per acre per year (for the first five years) and $1.00 per acre per year for the remainder of the 21 year term; this cost seems to be excessive for such a large area where there are no definite targets. The depth of combined overburden and sediments (in excess of 400') prohibits carrying out any further meaningful surveys (except, perhaps, more stratigraphic drilling to locate any possible thinning of this cover).

2) Concentrate all exploration efforts to the Athabasca Formation edge area on the "Southern Permits" (Permits 214 to 218). The objects here are:

   a) try to locate the sandstone edge (including possible outliers and "windows") more accurately;
   b) try to find any conductors (indicating possible fault or shear zones) and other subsurface and bedrock features using geophysics;
   c) try to establish the significance and origin of the lake geochemical anomalies by prospecting, boulder hunting and mapping and muskeg and soil geochemistry;
   d) try to relate the geochemical anomalies to bedrock features (as established by geophysics) which are deemed favourable for mineralization, eg. regolith, fault and shear zones; also have to consider the ice-movement directions and geochemical anomaly displacement (from the source) distances "down ice".

3) Eventually, using all the information gained by ground and airborne surveys, outlining additional drill targets. Criteria to be considered:

   a) proximity to sandstone edge;
   b) intersections of geophysical conductive zones;
   c) association of the above with "down-ice" geochemical anomalies, and particularly with mineralized boulders (if any).

4) The following sequence of activities is proposed:

   a) fly a combined Airborne E.M.-Mag. Survey over the sandstone edge area during April, 1977;
   b) use the results of this survey, combined with previous lake geochemistry results, to outline the areas of detail ground surveys to be carried out during the summer of 1977;
   c) carry out a muskeg geochemical survey of the area, paying particular attention to lake geochemical anomalies; do boulder hunting, etc.;
   d) extend the line-grids to cover the favourable areas; where necessary, add closer spaced lines;
   e) on the grid, run following:
      - V.L.F.-EM 16 surveys,
      - ground magnetic surveys,
      - resistivity surveys,
      - soil sampling: initially A_o horizon sampling only; consider soil sampling at depth where warranted,
      - consider Emanometry and "Track-Etch", etc., surveys for soil gas if and where warranted,
   f) review and re-evaluate all data;
   g) locate drill targets if and where warranted.

Project 508 - N.E. Alberta Permits Budget Summary, 1977 $369,400.

(revised March, 1977)

Activity Code #	Activity and Description	$ Allocated for (1977)
07	Drafting and Clerical - Ottawa (salaries)	$ 2,200.00
22	Geological Mapping (salaries, copter, etc.)	5,000.00
23	Geological Prospecting (salaries, copter, etc.)	6,000.00
26	Diamond Drilling (5 DDH's x 350'/ each x $30./ft. : $52,000. plus supervision, fuel, etc.) Done in February 1977.	64,000.00
30	Ground Geophysics (e.g. resistivity @ $500. x 100 line miles : $50,000. plus copter, fuel, etc).	63,000.00
33	Airborne Geophysics ($32./mile x 3,000 miles : $96,000., plus misc. costs).	100,000.00
40	Soil Geochemistry (including muskeg; salaries, copter, fuel, lab, shipping, etc).	23,000.00
50	Project Supervision (mainly wages and burden/year).	25,000.00
53	Project Personnel Support (camp gear, cook's wages, fuels, aircraft, food, travel, etc).	44,000.00
70	Disposition Maintenance (renewal of 5 "Southern Permits).	16,000.00
74	Line Cutting (e.g. $150. x 100 line miles : $15,000. plus survey, support, etc.)	21,200.00
	Total	$ 369,400.00

Eldorado Nuclear Limited

[redacted]

HL/sjp
29/3/77

H. Laanela,
Project Geologist.

ELDORADO
ELDORADO NUCLEAR LIMITED

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APPENDIX

PROJECT 508:

(N.E. ALBERTA PERMITS NOs. 185, 186, 187, 214, 215, 216, 217 and 218.)

DIAMOND DRILL LOGS FOR
DDH NO. 508-1 TO 508-16,
drilled Nov. 13 to Dec. 11, 1976, and Feb. 12 to Feb. 24, 1977.

(Including Downhole Gamma-ray logs for DDH No. 508-6, 9 and 14.)

DDH #508-1

DIP TESTS

TEST	FROM	TO	TOTAL	DIP CORR.	LATITUDE CUM.	DEPARTURE CUM.

DIAMOND DRILL HOLE LOG

Project 508

ELDORADO NUCLEAR LIMITED

LOCATION Permit 216
SECTION
LATITUDE
DEPARTURE
ELEVATION Surface
CORE B.Q.
STORAGE Drill Camp

HOLE No. 508-1
AZIMUTH
DIP Vertical
LENGTH 227.0
PURPOSE RECCO
COMPLETED 13/11/76
LOGGED BY C.J. Riley

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION
	0.0	Collar
0.0	100.0	NW Casing. Fine sand.
0.0	130.0	BW casing. Fine Sand. Start of core.
130.0	137.0	Amphibole gneiss. Grey-green, fine grained, brecciated at top. Low angles.
137.0	168.4	Gneiss: quartz-feldspar-biotite-amphibole. Fine to medium grained, grey, saturated with pink pegmatite. Crushed granular appearance. Bands to one foot pink pegmatite 10^{o} - 45^{o} - 30^{o}
168.4	171.5	Gneiss amphibole-biotite. Medium to dark grey-green, fine to medium grained, crushed appearance, occasional band pink pegmatite. 30^{o} - 60^{o}. Slightly contorted.
171.5	187.0	Gneiss quartz-feldspar, - biotite - amphibole as at 168.4. Saturated with pink pegmatite.
187.0	227.0	Gneiss quartz-feldspar-biotite, minor amphibole. Dark grey, medium grained, occasional stringer pink pegmatite. Sheared appearance 10^{o} - 20^{o}. Locally contorted.
	227.0	Foot of Hole.

Drilled by: D.W. Coates Enterprises Ltd.
Driller: L. Ross
Left in Hole: Nil
Logged: McPhar TV 1A #176-69 Background 2000 cpm.

CORE SAMPLES FROM	TO	WIDTH	%	AVERAGES

DDH#508-2

DIP TESTS

TEST	FROM	TO	TOTAL	DIP	DIP CORR.	LATITUDE	LATITUDE CUM.	DEPARTURE	DEPARTURE CUM.

DIAMOND DRILL HOLE LOG

Project 508

ELDORADO NUCLEAR LIMITED

LOCATION Permit 217
SECTION
LATITUDE
DEPARTURE
ELEVATION Surface
CORE BQ
STORAGE Drill Camp

HOLE No. 508-2
AZIMUTH
DIP Vertical
LENGTH 591'
PURPOSE RECCO
COMPLETED 17 Nov. 1976
LOGGED BY C.J. Riley

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION
	0.0	Collar.
	90.0	Start of Core. Fine sand.
90.0	90.8	Sandstone. Pale buff-purple, fine grained, well thinly banded @ 45°.
0.0	100.0	BW Casing.
90.8	103.0	Regolith. Brecciated, heavily chloritized, very fine grained, buff-grey-green, chlorite in patches. Occasional hematized fracture. Seams milky white quartz saturating the rock. Negative porosity.
103.0	107.4	Regolith as at 103.0 but more hematization although chlorite and green colour still predominate. No porosity.
107.0	155.3	Regolith. Heavily hematized, deep brick red in colour, brecciated, occasional small shear, core angles weak and vary considerably. Soaked in milky white quartz. No porosity.
155.3	157.4	Breccia. Altered feldspar fragments and quartz in a siliceous matrix. probably an altered pegmatite. Minor hematite around edges of fragments. Pale buff-grey in colour. Upper contact at 45° - sharp with overlying heavily hematized layer. Some minor chlorite. No porosity.
157.4	176.1	Regolith as at 155.3. Saturated milky white quartz. No porosity.
176.1	184.7	Breccia. Altered pegmatites white, leached, brecciated. Hematite around fragment edges. Weak banding @ 60°. No porosity.

CORE SAMPLES

FROM	TO	WIDTH	%	AVERAGES

P. 3

DIAMOND DRILL HOLE LOG

PAGE No. 2 HOLE 508-2

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	CORE SAMPLES FROM	CORE SAMPLES TO	CORE SAMPLES WIDTH	CORE SAMPLES %	CORE SAMPLES AVERAGES
184.7	218.0	Regolith as at 155.3. Saturated milky quartz after original brecciation and hematization. Superposed banding @ 45°. Tar filled fractures @ 210.5 & 216.0. Slight fracture porosity.					
218.0	220.4	Fault. Brecciated with soft gouge. Highly hematized. 45°.					
220.4	232.3	Regolith as at 155.3. 45°. No porosity.					
232.3	237.0	Breccia. Altered pegmatite. Hematite along fractures. Minor chlorite.					
237.0	246.2	Regolith as at 155.3. Occasional 6" band of milky quartz.					
246.2	249.9	Breccia. Altered pegmatite, hematized along fractures and fragment edges. Cream coloured altered feldspar. Minor fracture porosity.					
249.9	257.2	Regolith as at 155.3. Some leached fractures.					
257.2	302.9	Fault zone. Mylonite, breccia and gouge. 6" gouge @ 267. Bleached, some hematite concentrated in bands. More highly chloritized and green past 275.0. Numerous thin seams of gouge. Numerous fractures and some vuggy porosity. Occasional reading 2x background.					
302.9	377.4	Regolith as at 155.3. More pale cream-buff bands of altered feldspar with hematite on fractures and around edges. 50°. Saturated quartz. Some shearing and tar filling @ 322. 2" fault gouge at 252.5. Low porosity.					
377.4	381.0	Fault. Brecciated and mylonite. Pale cream-colour, faint red hematite cast. Minor fracture porosity.					
381.0	385.9	Regolith as at 377.4					
385.9	405.8	Fault. Breccia, mylonite, gouge. Pale cream-buff coloured fragments in mylonitic and siliceous matrix. Faint green (chloritic) cast. Some fractures hematite stained. Some tar on fractures.					

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DIAMOND DRILL HOLE LOG

PAGE No. 3 HOLE 508-2

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	CORE SAMPLES FROM	CORE SAMPLES TO	CORE SAMPLES WIDTH	CORE SAMPLES %	CORE SAMPLES AVERAGES
405.8	411.2	Regolith as at 377.4. Saturated quartz. No porosity.					
411.2	428.9	Fault. Brecciated and altered. Some red patches, some green chloritic bands. Feldspars altered to cream colour. Contorted. Bands and seams. Gouge. Saturated quartz. Fracture porosity.					
428.9	463.4	Regolith. Fragments not as altered. Mixed hematite and chlorite alteration. Large pink feldspars in places. Contorted, angles mostly along core. Relict pegmatite? saturated quartz. No porosity.					
463.4	499.2	Regolith - Chlorite alteration predominates but hematite still present in bands and fragments of breccia. Chlorite concentrated in bands to one foot separated by less altered pegmatite? with pink feldspars present. 10° - 30° 40°. Saturated quartz. No porosity.					
499.2	507.8	Regolith. Closely intermixed chlorite and hematite alteration chlorite predominates. Brecciated. Fine grained. Appears sheared: 40° . Saturated quartz. No porosity.					
507.8	572.0	Regolith. The alteration from here down the hole appears to reflect the original composition of the rock, i.e. mafic bands are highly altered to chlorite with minor hematite; more acid bands alter to hematite with minor chlorite; pegmatite and acid rocks are essentially unaltered. The whole core is brecciated and saturated with later quartz. Angles tend to 40°. No porosity. Minor tar on occasional fracture. Occasional spot to 2x background.					

DIAMOND DRILL HOLE LOG

PAGE No. 4 HOLE 508-2

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	CORE SAMPLES FROM	CORE SAMPLES TO	CORE SAMPLES WIDTH	CORE SAMPLES %	CORE SAMPLES AVERAGES
572.0	591.0	Breccia. Highly altered pegmatite? Feldspars cream coloured. Veined hematite and chlorite alteration. Saturated quartz. No porosity. Possibly a healed fault or lithologic change.					
	591.0	Foot of hole.					

Drilled by: D.W. Coates Enterprises Ltd.
Driller: L. Ross
Left in Hole: Nil.
Logged with: McPhar TV 1A #176-69
Background 2000 cpm.

⊕ Re section 90.0' to 90.8': This could be a boulder(?). (H. Laanela)

UUM #508-3

DIP TESTS

TEST	FROM	TO	TOTAL	DIP CORR.	LATITUDE CUM.	DEPARTURE CUM.

DIAMOND DRILL HOLE LOG

Project 508

ELDORADO NUCLEAR LIMITED

LOCATION Permit 216
SECTION
LATITUDE
DEPARTURE
ELEVATION Surface
CORE B.Q.
STORAGE Drill Camp

HOLE No. 508-3
AZIMUTH
DIP vertical
LENGTH 187.0
PURPOSE Racco
COMPLETED 19/11/76
LOGGED BY C.J. Riley

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION
	0.0	
0.0	60.0	Sand. Start of core.
0.0	70.0	BW casing.
60.0	70.9	Schist biotite-feldspar-quartz. Dark green-black, flecked with pink feldspar clqsts. Closts lineated @ 50°, fine to medium grained. Saturated quartz.
70.9	82.3	Pegmatite, brecciated, reddish-pink, medium grained, occasional coarser fragment. Saturated quartz.
82.3	87.0	Schist as at 70.9. Thin bands of pink pegmatite at low angles to along core.
87.0	88.4	Pegmatite as at 82.3.
88.4	95.9	Schist as at 70.9. Low angles.
95.9	99.4	Fault. Mylonite. Dark grey with some brick red bands. 20°, amorphous.
99.4	133.5	Pegmatite - brecciated. Medium grained, reddish pink feldspars somewhat altered. Cracked. Saturated quartz. Sheared at top @ 50°.
133.5	139.2	Schist as at 70.9. Dark grey-green, fine grained, pink feldspar Weak lineation @ 50°.
139.2	149.7	Schist as at 139.2 but much stronger lineation of closts @ 50°
149.7	152.0	Pegmatite breccia as at 133.5
152.0	172.8	Schist - mylonite. Very fine grained, medium grey, flecked pink feldspars. Occasional band of pink acidic material, crushed and finely brecciated. Angles generally 50°.

CORE SAMPLES FROM	TO	WIDTH	%	AVERAGES

DIAMOND DRILL HOLE LOG

PAGE No. 2 HOLE 508-83

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION
172.8	178.3	Pegmatite breccia as at 133.5. Few mafic bands 40°
178.3	186.2	Schist as at 139.2. 40°.
186.2	187.0	Pegmatite breccia as at 133.5
	187.0	Foot of hole.

Drilled by: D.W. Coates Enterprises Ltd.
Driller: L. Ross
Left in Hole: Nil
Logged: McPhar TV 1A #176-69
Background 4000 cpm.

CORE SAMPLES FROM	TO	WIDTH	%	AVERAGES

⊕ Also: On top of this section — 4 pebblized pieces of Athabasca sandstone core, — may be from boulders (as in DDH #2):
2 pieces — purple banded (crossbedded or bedded?) fine grained hard quartzitic ss., 1 piece almost white, very fine grained, hard quartzite; 1 piece buff colored, medium to fine grained typical Ath. ss. (H. Laanela)

DIP TESTS

TEST	FROM	TO	TOTAL	DIP CORR.	LATITUDE CUM.	DEPARTURE CUM.

DIAMOND DRILL HOLE LOG

Project 508

ELDORADO NUCLEAR LIMITED

LOCATION Permit 215
SECTION
LATITUDE
DEPARTURE
ELEVATION Surface
CORE B.Q.
STORAGE Base (drill camp 508)

HOLE No. DDH 508-4
AZIMUTH
DIP Vertical
LENGTH 167 ft.
PURPOSE Recco (strat)
COMPLETED Nov. 22/76
LOGGED BY ~~L.A. Homeniuk~~

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	CORE SAMPLES FROM	TO	WIDTH	%	AVERAGES
0'	164	Overburden					
164'	167	Athabasca sandstone (could be boulders).					
		End of Hole @ 167 - abandoned: set-up had to be moved due to sinking of drill rig in muskeg.					
		Drilled by: D.W. Coates Enterprises Ltd.					
		Driller: L. Ross					

DIP TESTS

TEST	FROM	TO	TOTAL	DIP CORR.	LATITUDE CUM.	DEPARTURE CUM.

DIAMOND DRILL HOLE LOG

Project 508

ELDORADO NUCLEAR LIMITED

LOCATION Permit 215
SECTION
LATITUDE
DEPARTURE
ELEVATION Surface
CORE B.O.
STORAGE Base camp 508

HOLE No. DDH 508-5
AZIMUTH
DIP Vertical
LENGTH 387 ft.
PURPOSE Recco (strat.)
COMPLETED Nov. 24/76
LOGGED BY L. Homeniuk

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION
0'	104.6	Overburden.
104.6	104.9	Sandstone boulder.
		104.9' to 137.0': DEVONIAN LIMESTONE
104.9	112.5	Limestone, bituminous at beginning of section, grading to light gray, calcite laths abundant. Bedding horizontal, due to differential in concentration of calcite laths; bedding wraps around fine grained sections (could be concretions @ 109'). Fine grained sections have no apparent bedding, contain shell fragments, are light gray and sometimes mottled. Stylolites and fractures filled with calcite are evident. Bitumen along some fractures. Porosity is not developed.
112.6	122.0	Limestone, light gray, commonly mottled, a few vugs generally filled with calcite and bitumen. Brachiopods and other shell fragments are common. Fractures filled with calcite. Boundaries are based on shell fragment frequency. Bedding evident in first 4' but grades into a massive sequence.
122.0	137.0	Limestone, light gray, mottling is common, massive. Shell fragments disappear. All fractures filled with bitumen, some pyrite evident (125'). Minor porosity developed, commonly filled with bitumen impacting a graphic-dendritic appearance to rocks (134').
		(137.0' to 256.0': POST-ATHABASCA REGOLITH)
137.0	156.0	Calcareous mud, light gray, generally soft, un-indurated, mottled, sometimes varved, clay-like; becomes indurated locally to form calcareous mudstone (147'). Organic material not evident.

CORE SAMPLES FROM	TO	WIDTH	%	AVERAGES

DIAMOND DRILL HOLE LOG

PAGE No. 2 HOLE 508-5

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	CORE SAMPLES FROM	CORE SAMPLES TO	CORE SAMPLES WIDTH	CORE SAMPLES %	CORE SAMPLES AVERAGES
156.0	172.0	Arenaceous mud, light gray, could contain some calcareous sections. Quartz content increases gradually, minor pyrite. No apparent bedding, soft, friable. Bitumen in poorly developed porosity @ 166.8'.					
172.0	202.0	Argillaceous sandstone, greenish-gray, some pink xenoliths, medium to fine-grained. Weathered. Boundary with upper unit is arbitrary. Green-gray sections are generally argillaceous. More arenaceous sections carry bitumen in interstices. Disseminated pyrite is common.					
202.0	217.0	Sandstone, generally pink, minor gray-green bands, medium grained, somewhat weathered. Friable but hard. Upper and lower boundaries are arbitrary. Fractures are filled with bitumen.					
217.0	230.0	Sandstone, gray to buff, fine grained. Fracturing is common. Bitumen is absent.					
230.0	235.0	Brecciated sandstone, generally gray in color, some buff fragments. Well indurated at top of section, friable and crumbly at 235'. Generally fine-grained. Brecciation evident due to colour.					
235.0	240.0	Sandstone with some bands of mudstone (soft), soft grained, gray. Some porosity. Minor accumulations of bitumen.					
240.0	240.8	Brecciated sandstone and limestone (lms as cement). Fragments generally less than 1 inch.					
240.8	251.5	Sandstone, gray to greenish gray, mottled, alternating coarse and fine grained sections, locally friable.					
251.5	256.0	(2 ft. of section missing) Alternating siltstone (mudstone) - sandstone bands; mudstone dominant at top of section. Laminae are horizontal. Small-scale slumping is evident. 256' - unconformity - depth of weathering?) 256' to 266.0': ATHABASCA FORMATION					
256.0	265.0	Sandstone; buff, medium grained, minor coarse grains throughout. Some cross-bedding. (Typical Athabasca sandstone).					
265.0	266.0	Basal conglomerate, not well developed. Gradational contact with basement rocks. Grain sizes: coarse to medium, slightly hematitic. No porosity.					

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DIAMOND DRILL HOLE LOG

PAGE No. 3 HOLE 508-5

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION
		(266' - Athabasca Unconformity)
		266.0' to 380.0': PRE-CAMBRIAN BASEMENT - REGOLITH ZONE)
266.0	323.0	Altered gneiss, originally granitic; coarse grained. Minor pyrite. Quartz is the only unweathered mineral. Feldspars altered into clay, commonly white, sometimes hematized. Biotites (chlorite?) always hematized. Hematite common along fracture planes. (Typical Athabasca Regolith).
323.0	342.0	Altered gneiss, very coarse grained, foliation not readily apparent. Calcite common. Not as hematized as above.
342.0	352.0	Altered gneiss, medium grained, strongly foliated. Feldspars kaolinized or sericitized (sometimes apple green in colour). Mafics and quartz relatively fresh. Hematization more common than in above.
352.0	380.0	Altered gneiss, slightly hematized. Feldspars are weathered to kaolinite (sericite?) along fractures. Fracturing common. Minerals less altered toward end of section. At 377' feldspars change from white to generally pink color.
		(380' - End of Regolith)
		380.0' to E.O.H.: UN-ALTERED BASEMENT)
380.0'	387.0	Granite gneiss; gray, coarse grained. Pyrite observed on one fracture. Rock is fresh.
		387': End of Hole #5
		Drilled by: D.W. Coates Enterprises Ltd. Driller: L. Ross

CORE SAMPLES FROM	TO	WIDTH	%	AVERAGES

DIP TESTS

TEST	FROM	TO	TOTAL	DIP CORR.	LATITUDE CUM.	DEPARTURE CUM.

DIAMOND DRILL HOLE LOG

Project 508

ELDORADO NUCLEAR LIMITED

LOCATION Permit 215
SECTION
LATITUDE
DEPARTURE
ELEVATION Surface
CORE B.Q.
STORAGE Base camp 508

HOLE No. DDH 508-6
AZIMUTH
DIP Vertical
LENGTH 346 ft.
PURPOSE Recco (strat.)
COMPLETED Nov. 26/76
LOGGED BY L.Homeniuk
D. Cruickshank

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	CORE SAMPLES FROM	TO	WIDTH	%	AVERAGES
0'	161.0	Overburden.					
		(161.0' to 262.0': POST-ATHABASCA)					
161.0	171.0	Mudstone, with arenaceous sections. Grey. Minor pyrite, fine grained, not fissile. Minor vuggy porosity.					
171.0	173.5	Sandstone. Friable, bituminous, clasts mainly quartzy, containing grey mud chips to 4 cm. long. Intragranular porosity.					
173.5	193.0	Mudstone; calcareous, grey. Poorly consolidated. At 187' a 2 cm thick bed of pink calcrite. Laminated near lower part of section.					
193.0	217.0	Sandstone, laminated; grey and buff. Argillaceous laminations irregular from 0.5 cm up. Darker laminae are more argillaceous. Granule size fragments appear to become more abundant towards bottom of section. Poorly consolidated. Some intergranular and fracture porosity.					
217.0	262.0	Breccia (sedimentary). Poorly sorted. Contains mud to pebble sized clasts. Grey, becoming pink near bottom. Many coarse (to 1 cm.) angular clasts, mainly at granitic aspect. Contains layers of mudstone and sandstone. Becomes very sandy near bottom , probably re-worked.					
		262.0' to 322.75': ATHABASCA FORMATION - Bedding horizontal, some bituminous patches, 10' missing.					
262.0	322.5	Sandstone - Athabasca Formation. Mainly buff, fine to medium grained Some pebble sized clasts, cross-bedded. One maroon-coloured coarse grained section about 3' thick. One patch fine crystalline pyrite 3 cm across. Porosity low, silica cement, one shale chip observed. Occasional thin (to 1 cm) mudstone layers.					

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DIAMOND DRILL HOLE LOG

PAGE No. 2 HOLE 508-6

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION
322.5	322.75	Basal conglomerate (Athabasca Formation). One section through fine quartzy cobble.
		322.5' to 346.0' : PRE-CAMBRIAN BASEMENT - REGOLITH ZONE
322.75	346.0	Altered gneisses. Original lithology granitic. Only quartz unaltered. Near top of section all other minerals altered to hematite and clays. Foliation (as defined by elongated quartz crystals) nearly perpendicular to axis of core. Original rock was medium grained crystalline. Alteration becomes more chloritic near bottom of section. Tight, little porosity.
		End of Hole #6 @ 346' (in altered rock).
		Drill contractor: D.W. Coates Enterprises Ltd. Driller: L. Ross
		Hole logged radiometrically (log attached). All readings near background.

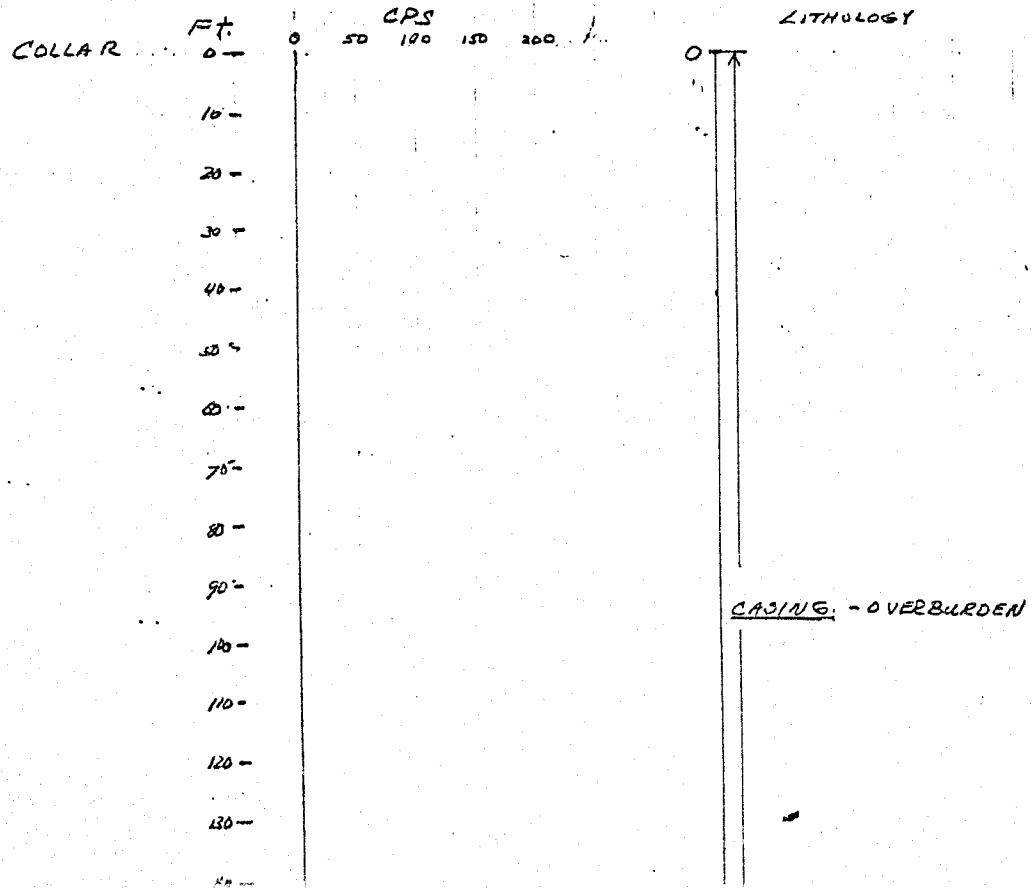
CORE SAMPLES FROM	TO	WIDTH	%	AVERAGES

PROJECT 508

RADIOMETRIC LOG - HOLE 508-6
NOV 26, 1976
(Total Count - Integral Mode)

CORE SIZE: BQ
X: D.C, NK; LH, WC: PM
INST: SCINTREX GSD-3

GAM-1



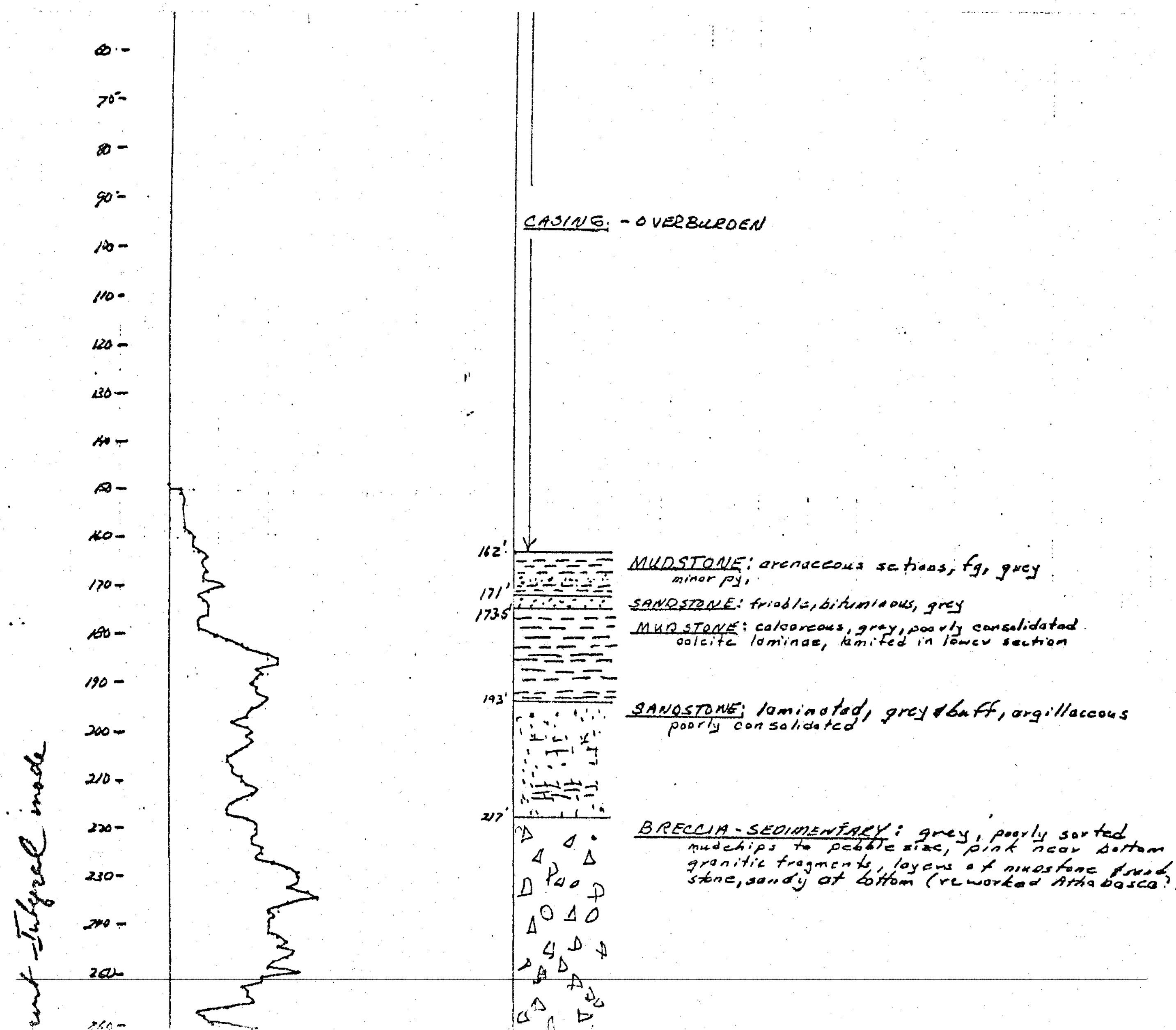
DDH #508-6
①

Graph 7

1977004

DDH # 508-6

(2)

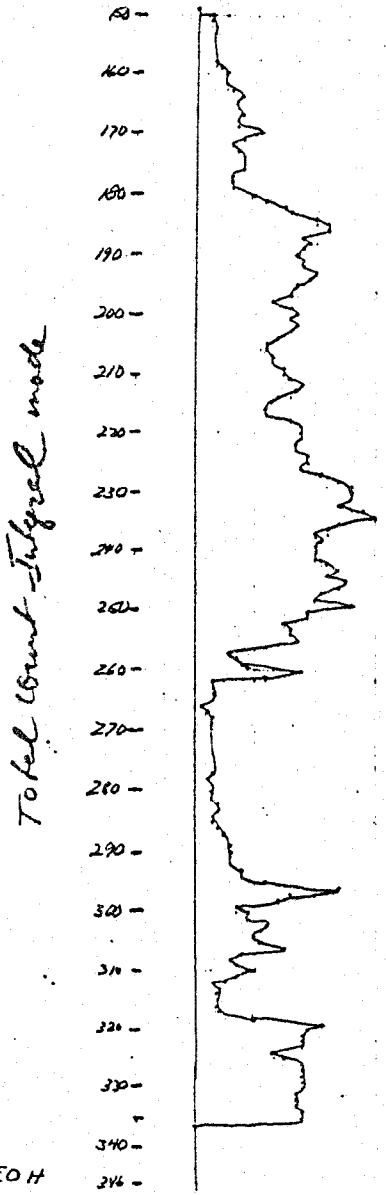


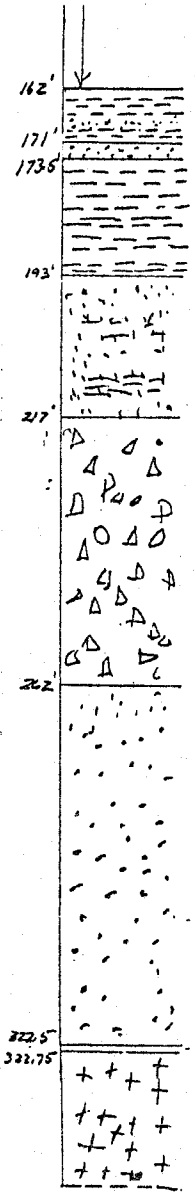
1977004

Graph 7a

DDH #508-6

(3)





162' – 171' **MUDSTONE**: arenaceous sections, fg, grey, minor py;

171' – 173.5' **SANDSTONE**: friable, bituminous, grey

173.5' – 193' **MUDSTONE**: calcareous, grey, poorly consolidated, calcite laminae, lamited in lower section

193' – 217' **SANDSTONE**: laminated, grey & buff, argillaceous, poorly consolidated

217' – 222' **BRECCIA - SEDIMENTARY**: grey, poorly sorted, mudchips to pebble size, pink near bottom, granitic fragments, layers of mudstone & sandstone, sandy at bottom (reworked Athabasca?).

222' – 322.5' **SANDSTONE**: Athabasca Fm., buff, fg-mg, minor pebbles, cross-bedded, minor hibification, py, poor porosity, mudstone layers.

322.5' – 322.75' **BASAL CONGLOMERATE**: Athabasca fm, one white quartz pebble thick

322.75' – EOH **ALTERED GNEISS**: granitic, and qtz unaltered, other minerals to hematitic and clays, alteration more chloritic near bottom of hole, no porosity, tight.

1977 Geophysics

DIP TESTS

TEST	FROM	TO	TOTAL	DIP CORR.	LATITUDE CUM.	DEPARTURE CUM.

DIAMOND DRILL HOLE LOG

Project 508

ELDORADO NUCLEAR LIMITED

LOCATION Permit 215
SECTION
LATITUDE
DEPARTURE
ELEVATION Surface
CORE B.Q.
STORAGE Base camp 508

HOLE No. DDH 508-7
AZIMUTH
DIP Vertical
LENGTH 194 ft.
PURPOSE Recco (strat.)
COMPLETED Nov. 27/76
LOGGED BY L. Homeniuk

CORE SAMPLES D. Cruickshank

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	CORE SAMPLES FROM	TO	WIDTH	%	AVERAGES
0	76.0	Overburden.					
		76.0' to 111.0': POST-ATHABASCA					
76.0	94.0	Mudstone; grey, poorly consolidated. Becomes increasingly arenaceous towards bottom of section. Laminated. Pyritic. Laminations normal to core axis.					
94.0	110.0	Sandstone; argillaceous, fine to medium grained. Vuggy, larger vugs filled with bitumen (tar). Wavy, argillaceous laminae at varying angles to core axis. Evidence of soft sediment deformation and slumping. Minor pyrite.					
110.0	111.0	Breccia. Angular fragments (to 1 cm long) in sandy matrix. Most fragments are granitic, many altered to hematite. Pyritic. Few minor vugs with bitumen.					
		(111.0': Paleozoic - Gneissic (Precambrian) Unconformity; No Athabasca Formation)					
		111.0' to 194.0': PRE-CAMBRIAN BASEMENT - REGOLITH ZONE					
111.0	122.0	Green altered gneiss. Unconsolidated to 115'. Chloritized, pyritic, highly fractured, original texture largely obscured.					
122.0	162.0	Red altered gneiss. Originally coarsely crystalline, very quartzose (±30%). Faulted in places (rock fractured and epidotized). All minerals, except quartz, altered to hematite. Rock later silicified. Weakly foliated. Difficult to measure porosity (low).					

DIAMOND DRILL HOLE LOG

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	CORE SAMPLES FROM	CORE SAMPLES TO	CORE SAMPLES WIDTH	CORE SAMPLES %	CORE SAMPLES AVERAGES
162.0	194.0	Red altered gneiss. Similar to above, but rock was originally porphyritic. Feldspar phenocrysts (altered but recognizable) to 5 cm long in purple-red hematite matrix. Quartz content here less than 10%. Shears rarer here, - marked by poorly consolidated, bleached looking minerals altered to clays. Preferred orientation of phenocrysts defines orientation @ ±30°- 40° to axis of core. Dark gray mineral (chlorite?) as irregular patches. (Specimen taken @ 191 ft.) Porosity low. (194.0': End of Hole #7 still in altered gneiss) Drilling contractor: D.W. Coates Enterprises Ltd. Driller: L. Ross Core checked with McPhar's TV-1A scintillometer No radioactivity above background.					

DIP TESTS

TEST	FROM	TO	TOTAL	DIP CORR.	LATITUDE CUM.	DEPARTURE CUM.

DIAMOND DRILL HOLE LOG

Project 508

ELDORADO NUCLEAR LIMITED

LOCATION Permit 185
SECTION
LATITUDE
DEPARTURE
ELEVATION Surface
CORE B.Q.
STORAGE Drill Camp 508

HOLE No. DDH 508-8
AZIMUTH
DIP Vertical
LENGTH 187'
PURPOSE Recco (Strat.)
COMPLETED Nov. 30/76
LOGGED BY L. Homeniuk

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	CORE SAMPLES FROM	TO	WIDTH	%	AVERAGES
o'	45.0'	Overburden; many boulders.					
		(45.0' to E.O.H. - POST-ATHABASCA)					
45.0	57.0	Limestone (Devonian), gray, fossiliferous @ 54', fine grained, bitumen along fractures.					
57.0	72.0	Limestone breccia, argillaceous limestone, arenaceous limestone, minor siliceous mudstone, interlayered. Grey; breccia is bituminous, laminated, porous near end of section; large vugs filled or partly filled with calcite, pyrite; bitumen @ 71' Poorly consolidated generally.					
72.0	157.0	Sandstone; grey, fine to medium grained; some mudstone sections (less than 25 cm. thick), sandstone sometimes friable; minor porosity. Bitumen in some pores, saturating some medium grained sections. (Sample of mudstone taken @ 128'). Minor pyrite.					
157.0	187.0	Sandstone; medium grained; very friable. Laminated, bituminous, Section similar to above. 20' of core missing - unconsolidated sand. Hole blocked due to washing and in-filling.					
		(187.0': Hole lost and abandoned. Core barrel lost. Hole completely within Post Athabasca (Devonian?) rocks.)					
		Drill contractor: D.W. Coates Enterprises Ltd. Driller: L. Ross					
		Core checked for radioactivity with Scintrex TV-1A. Background readings only.					

DIP TESTS

TEST	FROM	TO	TOTAL	DIP	DIP CORR.	LATITUDE	LATITUDE CUM.	DEPARTURE	DEPARTURE CUM.

DIAMOND DRILL HOLE LOG

Project 508

ELDORADO NUCLEAR LIMITED

LOCATION Permit 186
SECTION
LATITUDE
DEPARTURE
ELEVATION Surface
CORE B.O.
STORAGE Base Camp 508

HOLE No. DDH 508-9
AZIMUTH
DIP Vertical
LENGTH 597 ft.
PURPOSE Recco (strat)
COMPLETED Dec.4/76
LOGGED BY D. Cruickshank

CORE SAMPLES H. Laanela

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	CORE SAMPLES FROM	CORE SAMPLES TO	CORE SAMPLES WIDTH	CORE SAMPLES %	CORE SAMPLES AVERAGES
0'	91'	Overburden					
		91' to 109': POST-ATHABASCA SEDIMENTS					
91	109	About 10' missing. Mainly argillaceous sandstone, with interbedded mudstone. Grey, medium grained, friable, poorly consolidated Some vuggy porosity, filled with bitumen (tar), particularly from 106' to end of section. Also intergranular porosity in sandstone. Bottom part (including missing part?) soft and muddy. Paleozoic (Devonian?).					
		109' to 437.5': ATHABASCA FORMATION					
109	191	Athabasca sandstone, oilstained (bituminous) in parts; from 109' to 121' over 60% is dark oilstained, some massively. "Clean" sandstone is buff to whitish, well sorted, medium grained quartz sandstone. Largely cross-bedded. Has muddy partings, some mud-chips. Bedding planes from 90° to 70° to the axis at core. Some pinkish banding. Some hematitic partings @ 111'. Mottling below 170'. Intergranular porosity only.					
191	290	Athabasca sandstone. Oilstains rare (mostly near top). Buff, medium grained, cross-bedded. Occasional pink to red (hematitic?) bands @ 90° -70° to axis of core. Mud-chips and muddy partings are common. Odd specks of mottling (possibly chlorite?). Intergranular porosity only. (So far: typical Athabasca Formation sandstone).					
¢90	362	Sandstone, as above , except for more pinkish banding and some purplish layers throughout the section. No bitumen. Mottling very rare.					

DIAMOND DRILL HOLE LOG

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	CORE SAMPLES FROM	CORE SAMPLES TO	CORE SAMPLES WIDTH	CORE SAMPLES %	CORE SAMPLES AVERAGES
362	368	As above, but highly fractured. All fractures filled with solid tar up to 1 cm thick.					
368	375.5	Same as in 290' - 362'.					
375.2	382	Coarser sandstone, with pebbles and purple bands up to 1 ft. thick. Cross-bedded. Mud-chips and mud along partings.					
382	436.5	Basal conglomerate. Subrounded clasts in sandy matrix. Granular conglomerate near top (less than pebble size), coarser fragments from 392' down. Mainly buff, with purple banding in top 16'. Poorly sorted. Maximum diameter of pebbles about 5 cm (2"). Poorly bedded (to no bedding). Matrix in bottom part becomes dark-purplish.					
436.5	437.5	About 1 ft. zone of gradual transition between basal conglomerate and top of regolith zone.					
		437.5' to E.O.H.: PRECAMBRIAN BASEMENT AND REGOLITH ZONE					
437.5	460	Strongly altered: Basement rocks and regolith: softer and less silicified than in previous DDH's. Deeply weathered, with original textures obscurred, color varies from very light (clays) to reddish and dark purple. Present grain size is fine (e.g. clays and hematite). A few unaltered and flattened quartz crystals @ about 455'.					
460	472	Highly silicified regolith, original textures destroyed. From 465' to 466': vugs and fractures coated with hematite. Mostly grey to light pinkish grey. From 470' to 472': fractures coated with hematite. Clay layers parallel to core axis @ 472', also some clay minerals above.					
472	492	Altered basement rocks with original gneissic textures becoming more apparent. Very strongly hematized; mostly reddish, some purplish in upper part of this section. Original texture is of coarse grained granitic gneiss; the present texture is finer. Clay alteration. Not well silicified; soft. Gneissic foliation about 60° to axis at core. Less than 10% quartz, poor porosity.					

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DIAMOND DRILL HOLE LOG

PAGE No. 3 HOLE 508-9

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION
492	503	Altered rock with original texture apparent. Pale grey, indicating mainly clay alteration, with some greenish layers (altered feldspars?). At 498' about 1 ft. zone of altered pegmatite. Grain size medium to coarse. Original rock was probably gneissic granite.
503	530	As above, but darker. Deep red-purple. Feldspars altered to whitish and pale greenish minerals (clays?). Porosity is generally very low; some fracture porosity. Medium to coarse grained. Gneissic granite.
530	590	Pale greenish grey to purplish altered coarse grained gneissic granite. Locally more fractured than above, with specks of tar in fractures. All minerals except quartz are altered. Numerous purple sections appear below 550'. Soft and friable, not silicified. Some fracture porosity (low). Some chloritic alteration with fractures. At 572' foliation at 40° to core axis. Specks of tar in fracture @ 585'.
590	597	Similar to above but less altered and fractured.
		(End of Hole #9 @ 597', still in altered granite).
		Casings could not be removed from the hole; probably blocked by boulders.
		Drilled by: D.W. Coates Enterprises Ltd. Driller: L. Ross
		Core was checked for radioactivity with Scintrex TV-1A, readings on 1-2 x B.G. Part of the hole was probed radiometrically.

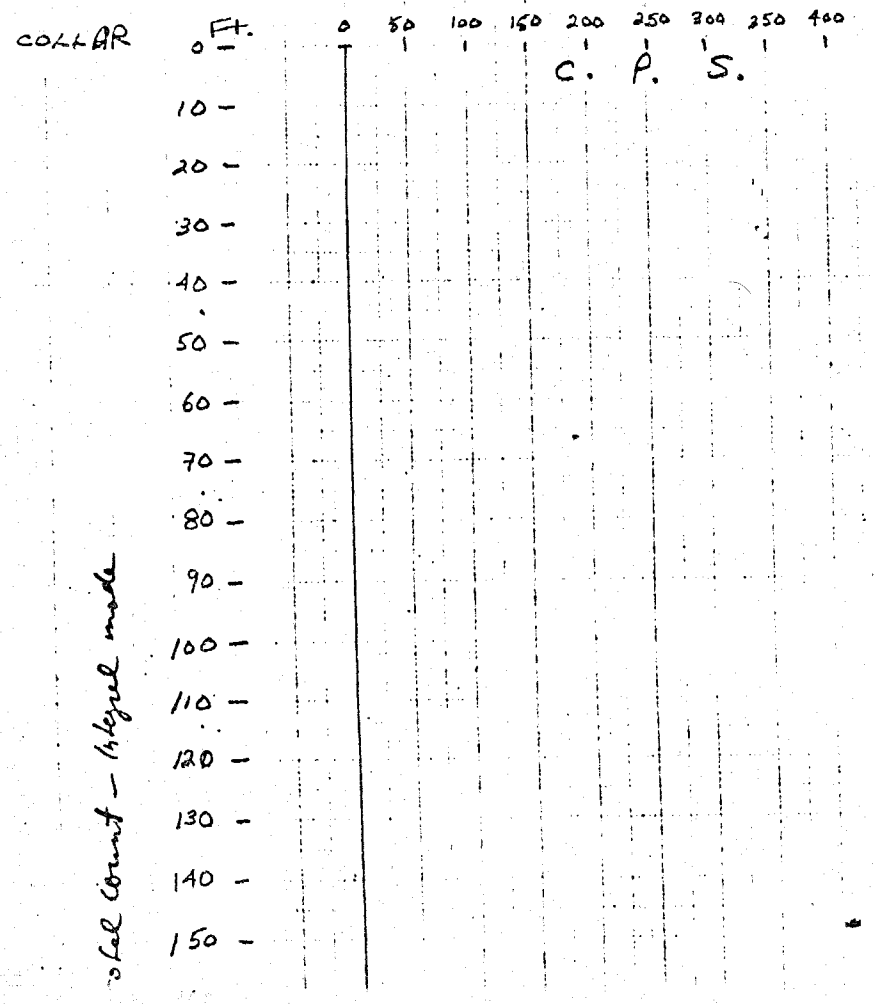
CORE SAMPLES FROM	TO	WIDTH	%	AVERAGES

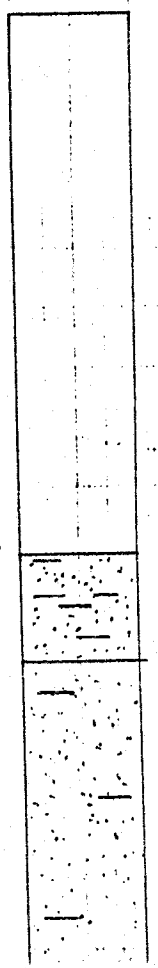
PROJECT 508

Radiometric Log — Hole 508-9
(9 Dec 76)

Total Count — Integral Mode

T : DC NK : PM WO : HL
Inst. GSD-3 GAM-1





Over burden

DDH#508-9

①

Post-Athabasca Sediments

Mainly argillaceous sandstone; some mudstone. Grey, poorly consolidated, bituminous

Sandstone (Athabasca Fm)

Generally medium grained; cross-bedded; buff and deep purple in colour. Mud chips and muddy partings. Some sections (especially near top) heavily oil-stained. Some tar.

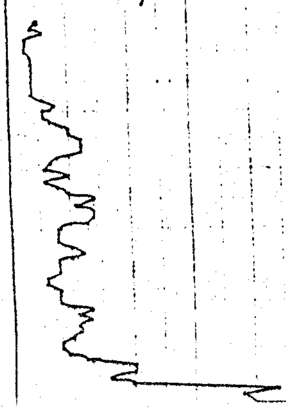
Sept 8 1977

Total count – Integral mode

LOG

Depth
90 –
100 –
110 –
120 –
130 –
140 –
150 –
160 –
170 –
180 –
190 –
200 –
210 –
220 –
220 –
240 –
250 –
260 –
270 –
280 –

Stop Log – Pulley iced up.



OGY

91'

Post- Athabasca Sediments

Mainly argillaceous sandstone; some mudstone. Grey, poorly consolidated, bituminous

109'

Sandstone (Athabasca Fm)

Generally medium grained; cross-bedded; buff and deep purple in colour; Mud chips and muddy partings. Some sections (especially near top) heavily oil-stained. Some tar.

DDH #588-9

(2)

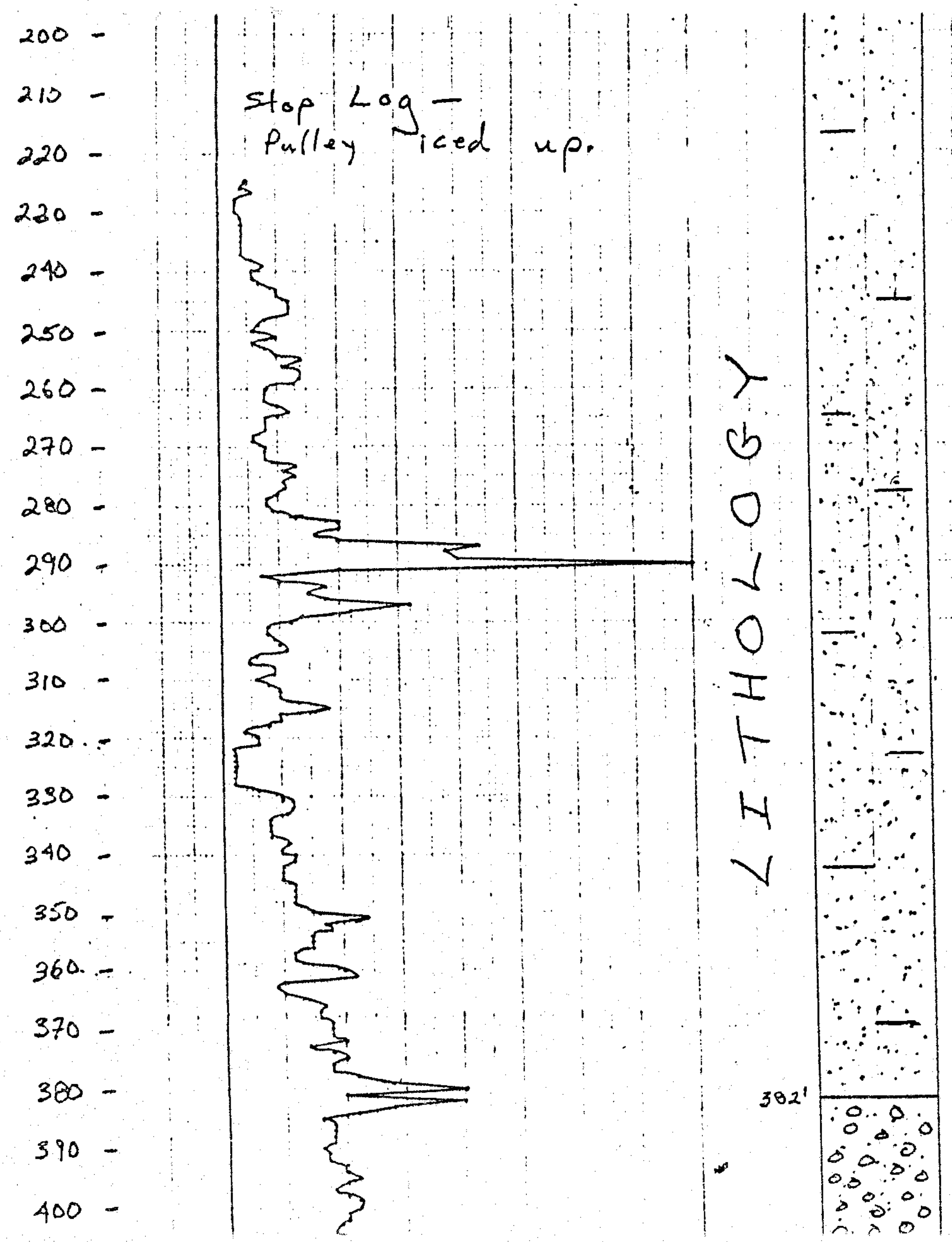
1977004

Graph 8a

DDH #508-9

(3)

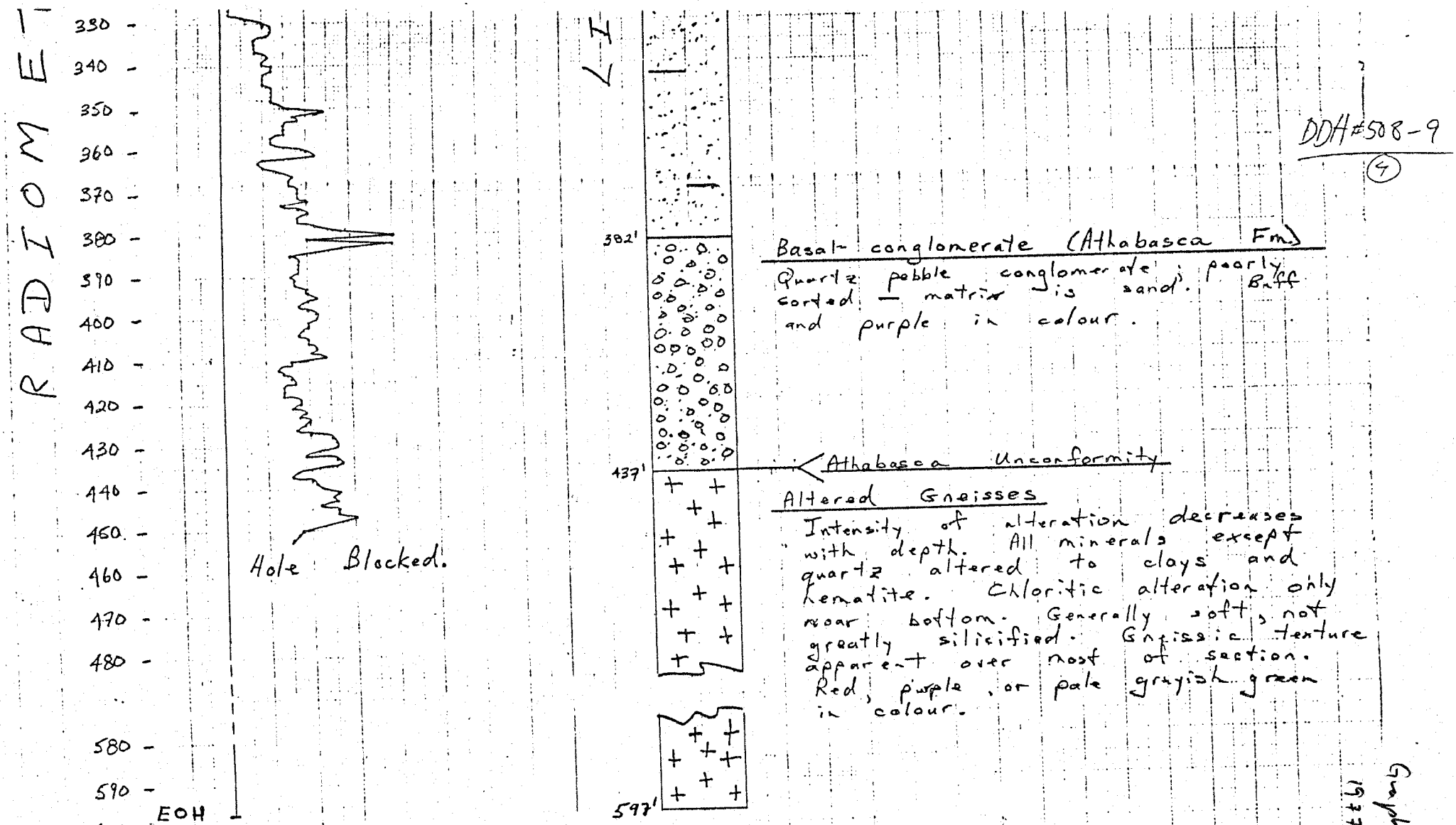
RADIOMETRIC LOG



Basal conglomerate (Athabasca Fm)

Quartz pebble conglomerate; poorly sorted — matrix is sand. Buff and purple in colour.

Graph 8 Aug 4 1977


RADIOMETRIC
330
340
350
360
370
380
390
400
410
420
430
440
450
460
470
480
580
590
600
EOH
Hole Blocked.
382'
437'
597'
Basal conglomerate (Athabasca Fm.)
Quartz pebble conglomerate, poorly sorted, matrix is sand. Buff and purple in colour.
Athabasca Unconformity
Altered Gneisses
Intensity of alteration decreases with depth. All minerals except quartz altered to clays and hematite. Chloritic alteration only near bottom. Generally soft, not greatly silicified. Gneissic texture apparent over most of section. Red, purple, or pale greyish green in colour.
DDH#508-9
(4)
Sept '82

p.21

DIP TESTS

TEST	FROM	TO	TOTAL	DIP	DIP CORR.	LATITUDE CUM.	DEPARTURE CUM.

DIAMOND DRILL HOLE LOG

Project

ELDORADO NUCLEAR LIMITED

LOCATION Permit 187
SECTION
LATITUDE
DEPARTURE
ELEVATION Surface
CORE B.Q.
STORAGE Base Camp

HOLE No. DDH 508-10
AZIMUTH
DIP Vertical
LENGTH 387'
PURPOSE Recco (Strat.)
COMPLETED Dec. 7/76
LOGGED BY Cruickshank & Laanela

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION
0'	121'	Overburden (121' to 275.5': POST-ATHABASCA SEDIMENTS)
121	142	Devonian (?) argillaceous limestone with possibly some dolomite. Medium gray, very fine grained, horizontally laminated. Fossiliferous, with brachiopods and crinoid stems. Generally very tight, only a few vugs.
142	157	Interbedded mudstone and limestone (laminae from 1 mm to 15 + mm thick). Some small dark bands (bitumen? and/or mud). Mud laminae soft. Locally porous. Gray.
157	172	Mudstone, first 5' calcareous, becomes arenaceous from 165' down. Gray to bluish gray.
172	252.5	Argillaceous sandstone. Gray, friable, poorly cemented. Hard, siliceous, black, cherty (?) patches from 196' to 217'. Medium grained, coarser toward bottom. Good intergranular porosity, some vuggy and fracture porosity. From 233' to 250' laminated (90° to core axis) mudstone with muddy sandstone, well consolidated, quite vuggy in places. From 250' to 252.5' the section is coarser grained, grading into conglomorate in next section; very porous (intergranular and small vugs).
252.5	268.5	Granule to pebble sized conglomerate in sand matrix (probably reworked Athabasca sandstone ?) Clasts are mainly quartz or chert; a few gneissic pebbles in lower part of section. Gray. Good intergranular porosity, some vugs.

CORE SAMPLES

FROM	TO	WIDTH	%	AVERAGES

DIAMOND DRILL HOLE LOG

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	CORE SAMPLES FROM	CORE SAMPLES TO	CORE SAMPLES WIDTH	CORE SAMPLES %	CORE SAMPLES AVERAGES
268.5	275.5	Sandstone. Pinkish-buff, medium grained, fractured, poorly consolidated. Intergranular porosity. Probably reworked Athabasca sandstone. (No bitumen or tar seen in above sections.)					
		(275.5' to E.O.H. 387': ATHABASCA FORMATION)					
275.5'	308	Typical Athabasca sandstone: Medium to coarse grained, buff to reddish pink, with some pebbly layers. Hard, well indurated quartz sandstone with intergranular porosity. Not well sorted. No mud. Massive, poor bedding (indistinct), a few cross beds. Rare purple bands toward bottom of section.					
308	325.5	Varicoloured sandstone; buff to pink to dark purple distinct bands of variable thickness (often gradual). Wavy but approximately horizontal bedding. Poor sorting. Medium grained, occasionally coarse. Mainly intergranular (with some fracture) porosity. Some small quartz clasts.					
325.5	332	Sandstone. Buff above, pinkish below, medium to coarse grained. Intergranular porosity. Homogeneous (massive). Indistinct bedding. Some small quartz pebbles throughout. Poor sorting.					
332	367	Sandstone, varicoloured, as in 308' to 325.5' (above). Purple bands increase in thickness and frequency toward bottom of section and purple colour becomes dominant. Bedding is wavy and mainly horizontal; in places bedding is lenticular. Intergranular and some fracture porosity. Poor sorting. Number of quartz clasts (pebbles) increases with depth. Section also becomes hematitic in about last 10 feet.					
367	387	Sandstone. Pinkish above, becoming darker reddish-pink below with crossbedding. Also thin lenticular beds of whitish fine grained material toward bottom of section. A few quartz clasts (up to 1 cm thick) throughout section. Medium to coarse grained; intergranular porosity, hard well cemented. (No tar or bitumen in any of the above sections).					

P.23

DIAMOND DRILL HOLE LOG

PAGE No. 3 HOLE 508-10

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	CORE SAMPLES FROM	CORE SAMPLES TO	CORE SAMPLES WIDTH	CORE SAMPLES %	CORE SAMPLES AVERAGES
		End of Hole #10 @ 387'; hole was abandoned due to sand cave-in causing rods to get stuck; 130 feet of rods and core barrel had to be left in the hole. Bottom of the hole is apparently still well into Athabasca sandstone. No downhole logging was carried out. Core was checked radiometrically with Scintrex TV-1A; all readings were within 1-2xB.G. range.					
		Drilled by: D.W. Coates Enterprises Ltd. Driller: L. Ross					

P.24 (end)

DIP TESTS

TEST	FROM	TO	TOTAL	DIP CORR.	LATITUDE CUM.	DEPARTURE CUM.

DIAMOND DRILL HOLE LOG

Project 508

ELDORADO NUCLEAR LIMITED

LOCATION Permit 216
SECTION
LATITUDE
DEPARTURE
ELEVATION Surface
CORE None
STORAGE

HOLE No. DDH#508-11
AZIMUTH
DIP Vertical
LENGTH 224 ft.
PURPOSE Recco (strat.)
COMPLETED Abandoned Dec 1[illegible]
LOGGED BY H. Laanela 19[illegible]

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION
0'	224'	Overburden (mainly sand). No bedrock encountered; drilled to 224' with Tricone bit (NW casing) until run out of casing, hole then abandoned. Drilled by: D.W. Coates Enterprises Ltd. Driller: L. Ross (DDH #508-11 was the last hole drilled in 1976).

CORE SAMPLES FROM	TO	WIDTH	%	AVERAGES

DIP TESTS

TEST	FROM	TO	TOTAL	DIP CORR.	LATITUDE CUM.	DEPARTURE CUM.

DIAMOND DRILL HOLE LOG

Project 508

ELDORADO NUCLEAR LIMITED

LOCATION Permit 187
SECTION
LATITUDE
DEPARTURE
ELEVATION Surface
CORE B.Q.
STORAGE Base Camp

HOLE No. DDH #508-12
AZIMUTH
DIP Vertical
LENGTH 368'
PURPOSE Recco (strat.)
COMPLETED Feb. 12. 1977
LOGGED BY H. Laanela

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION
0'	66'	Overburden (66' to E.O.H. @ 368': ATHABASCA FORMATION)
66'	75'	Typical Athabasca Sandstone: Medium to fine grained pale whitish pink with minor darker pink to purplish banding and bedding @ 90°-70° to core axis. Some indistinct crossbedding. Hard, well indurated quartz sandstone with intergranular porosity, poorly sorted. Contains occasional white mud-chips, also some mud along partings. Grades into next, more banded section.
75'	99'	Sandstone becomes more banded, with more pronounced crossbedding, and less pure. Mud chips and muddy partings more frequent in mid part of this section. Fine to medium grained, hard. Bands often wavy or lenticular, colour from reddish pink to dark purple, width usually less than ½"; a few small (+ ¼") brownish clasts associated with banding. Crossbeddings from 90° to 60° to core axis.
99'	130'	The above grades back into light pinkish white to buff sandstone similar to 66'-75' section. A few mudchips and muddy partings. Minor light-purple banding; indistinct crossbedding in places. Mostly fine grained, very hard, well indurated, very little porosity.
130'	175'	The above grades into more differentially sorted sandstone. Fine to medium grained with some coarser layers of porous quartz sand up to 1" in thickness. Numerous purplish banded sections alternate with whitish uniform sections. A few large (up to 1" long) mudchips; some muddy partings associated with dark banding. Some narrow, dark, hematitic bands have R/A up to 2xB.G. (eg. a 2" section with several thin bands @ 143') Crossbedding, with good sorting of sand, occurs several times in this section; bedding 90° to 70° to axis of core. Bedding and banding does not always coincide. The banding is often wavy, lens-like or almost spherical and may cut across bedding planes. Good intergranular porosity in coarser portions.
175'	224'	Grades into poorly bedded, not well banded, almost white to buff, fine to medium grained quartz sandstone. Some 1'-2' portions are coarser grained with good intergranular porosity. A few mudchips. Some very small (less than 1/8") dark greenish black specks scattered throughout (tarnished pyrite), Hard, well indurated.

CORE SAMPLES FROM	TO	WIDTH	%	AVERAGES

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	CORE SAMPLES FROM	TO	WIDTH	%	AVERAGES
224'	238'	As above, but containing darker, purplish banded portions with occasional large mud chips; also mud along fractures; parts are crossbedded. Pyritic specks as above.					
238'	270'	Similar to 175'-224' above, with sorting more common. Fine to coarse grained, with intergranular porosity, occasional blebs of pyrite. Minor cross-bedding, 90°-80° to core axis. Pinkish white.					
270'	290±'	The above grades into more banded and layered sandstone. Banding is pink to brownish purple. Occasional mud in chips and fractures. Pyritic blebs often larger (up to ¼") and in clusters or rough layers. Banding often wavy or lenticular, with lines converging around dark purplish spots surrounding some mud chips. Some crossbedding with good sorting locally. Cross bedding and banding may intersect; some purplish-brownish mottling.					
290±'	332'	Gradual change to "muddier", less pure looking sandstone containing coarser sections (sorting) with pinkish to brownish bands. Several fractures containing whitish gray mud ¼"-½" thick; 2" to 3" (+?) section of layered pale greenish white mud (fissile) at 303' @ 85° to axis of core. Minor mottling (brownish spots). Some "sorting", with thin coarse grained layers of sand throughout section.					
332"	332.5'	About 6" of fissile, whitish grey, soft mud, perpendicular to core.					
332.5'	368'	Sandstone as before: pinkish white with with many thin bands, pink to purplish, throughout section. Occasional mud chips; also mud in some fractures. Mottling, with small purplish spots and minute greenish-black specks (pyrite?) Cross bedding usually indistinct. Frequent sorting of coarser grain sand in thin layers, containing minor mud. Banding is often wavy at various angles and may cross the bedding, reddish toward E.O.H.					
		(END OF HOLE #12 @ 368' - still in sandstone (302').)					
		Drilled by: D.W. Coates Enterprises Limited Driller: Larry Ross					
		Core checked for radioactivity with SPP2 scint; readings 10-20 cps, some darker bands up to 25 cps. No tar (oil staining) was seen.					

DIP TESTS

TEST	FROM	TO	TOTAL	DIP CORR.	LATITUDE CUM.	DEPARTURE CUM.

DIAMOND DRILL HOLE LOG

Project 508

ELDORADO NUCLEAR LIMITED

LOCATION North of Permit 214, Twp 102-R1
SECTION
LATITUDE
DEPARTURE
ELEVATION
CORE B.Q.
STORAGE Base Camp

HOLE No. DDH #508-13
AZIMUTH
DIP Vertical
LENGTH 218 feet
PURPOSE Recco (strat.)
COMPLETED Abandoned 15/2/7
LOGGED BY H. Laanela

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION
0'	120'	Overburden. (120' to E.O.H. @ 218': POST-ATHABASCA SEDIMENTS) Core recovery about 40%.
120'	175'	Muddy Sandstone (to sandy mudstone): Medium grained. Buff to locally light greenish-gray coloured; soft, friable and very porous. Very broken core(poor recovery and poor drilling), particularly from 128' to 168' where core consists of very muddy rubble, most of it (±60%) being washed away; pyrite blebs (up to 1/8" across) and fine crystals are common in this part. Bedding is not obvious. Some 1"-2" portions are clay-like (can be cut with knife). The last 7 feet shows some layering, with thin cherty bands and nodules, also some soft greenish bands, nearly horizontal. Harder, more sandy towards bottom of this section.
175'	175.5'	Hard, buff to gray coloured fine grained sandstone cemented with clay.
175.5'	176'	Fractured, whitish, very fine quartzitic sandstone, cemented with minor clay.
176'	183'	Fine to coarse grained sandstone (as in 175'-175.5' above), becomes coarser toward bottom of section, with quartz grains in clay-like matrix. Gray. Some intergranular porosity. Contains occasional altered, angular rusty pebbles (±½"), and pyrite in some fractures. Probably reworked sandstone from the above sections? Grades gradually into next section.
183'	188'	Similar to above but coarser; broken core, about 3' missing. Reworked sandstone.
188'	198'	About 90% of core is missing; consists of 6 pieces whitish, soft quartz sandstone, with softer parts being washed out. Very porous; much quartz.
198'	208'	Reworked sandstone (as in 183'-188'). Medium to coarse grained, gray, quartz grains with clay matrix. Porous.
208'	218'	About 75% of core missing. Grades from the section above into brecciated, mixed rock near E.O.H.: Sand-clay matrix contains green fragments of chloritic metamorphic material. Some fracturing; fragments are angular. Assumed to be regolith (Post-Athabasca?)

CORE SAMPLES FROM	TO	WIDTH	%	AVERAGES

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	CORE SAMPLES FROM	TO	WIDTH	%	AVERAGES
		(END OF D.D.H. #13 @ 218'. Hole was abandoned due to drilling, i.e. blocking and casing becoming stuck. About 60 feet of casing was broken off and left in the hole.) The core was tested with a SPP2 scintillometer; no radioactivity above background was noted. Drilled by: D.W. Coates Enterprises Limited Driller: Larry Ross COMMENTS: No Athabasca Formation sandstone was observed in the core. The bottom part of DDH #13 appears to consist mainly of reworked sandstone with some fragments of metamorphic rock.					

DIP TESTS

TEST	FROM	TO	TOTAL	DIP	DIP CORR.	LATITUDE	LATITUDE CUM.	DEPARTURE	DEPARTURE CUM.

DIAMOND DRILL HOLE LOG

Project 508

ELDORADO NUCLEAR LIMITED

LOCATION Permit 214
SECTION
LATITUDE
DEPARTURE
ELEVATION Surface
CORE B.Q:
STORAGE Base Camp

HOLE No. DDH #508-14
AZIMUTH
DIP Vertical
LENGTH 478 feet
PURPOSE Recco (strat.)
COMPLETED Feb. 19, 1977
LOGGED BY H. Laanela

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION
0'	196'	Overburden.
		(196' to 222': POST-ATHABASCA SEDIMENT) Core recovery about 93%
196'	222'	Sandy Mudstone: to very muddy sandstone. Some sections are mostly clay and silt. Yellowish-grey where sandy, greenish gray where clayey. Medium-hard locally, but mostly soft. Finer grained toward top, but increasingly coarser (gritty) toward bottom. Bottom 2' contains increasingly larger quartz grains, with quartzite fragments (of reworked Athabasca sandstone) in the last 6 inches, in muddy sandstone matrix. Two rusty-brown soft ferruginous portions, 8" and 4" thick, @ about 205' and 206' respectively. Intergranular porosity in sandy portions, with small vugs, particularly toward bottom of the section; contains also some green clay chips and thin layers of clay (¼"-½"), mostly horizontal. Minor blebs of, and fine grained pyrite: Quartz grains are well rounded. Good core recovery, but some clay-rich core is broken. The contact with the next section (below) is sharp and definite.
		(222' to 383': ATHABASCA FORMATION) Core recovery 97 to 100%
222'	254'	Typical Athabasca Sandstone: In sharp contact with the above section. Recovery almost 100%. Medium to coarse grained, hard quartz sandstone, colour almost white to pale gray to pale pink in more layered portions. Coarser portions have intergranular porosity, with minor vugs and minor whitish clay in matrix. Bedding and sorting becomes more apparent in bottom half of this section; some angular to sub-angular quartz grains are up to 1/16" to 1/8" in diameter. One inch thick mud layer @ 248.5'. Some crossbedding, up to 60° to core axis.
254'	258'	Transitional, between the sections above and below: much like the above sandstone which becomes locally more banded. Has more whitish clay in matrix; less pure quartz. Fine reddish-pink to purplish bands occur in top 1½', with three 1" to 1½" thick, hard, fine, buff coloured mud layers. Bottom 1' is very hard, fine grained, pink to purplish quartz sandstone. Minor crossbedding.

CORE SAMPLES FROM	TO	WIDTH	%	AVERAGE

DIAMOND DRILL HOLE LOG

 HOLE DDH #508-14

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	CORE SAMPLES FROM	TO	WIDTH	%	AVERAGES
258'	280'	Variably coloured, strongly banded Sandstone: Very coarse to medium grained pale pink parts of the section alternate repeatedly within a few inches with very fine grained reddish-brown, hard, cherty and hematite rich layers. Some smooth nearly horizontal parting occurs along layers of thin very fine clay. Medium to coarser grained parts show whitish clay in matrix; quartz grains are subangular to subrounded; some intergranular porosity, also some small vugs. Crossbedding is not well defined; poor sorting. Greenish-gray cherty bands and lenses (often distorted or broken) appear in bottom half of this section; these are often bounded by hard, buff-coloured clay or fine mud and dark hematitic material. (Core recovery about 96%)					
280'	303'	Similar to transitional zone in 254' to 258' above: Impure quartz sandstone with some clayey, or locally, hematitic, matrix. Contains a few pyrite blebs and red (hematitic) mud chips. Pinkish-white to buff; medium to coarse grained. Intergranular porosity, some vugs. Minor crossbedding, sorting generally poor.					
303'	336'	The above sandstone becomes more banded again, similar to section 258'-280' in places. Dark purplish bands increase in thickness and frequency toward bottom of section, alternation with whitish, more quartzitic layers. Contains many thin, fine, brick-red hematitic blebs and fine fracture fillings and mud-chips. From fine to coarse grained. Sandstone becomes increasingly impure. Contains also some buff coloured flattened mud chips.					
336'	341'	The above sandstone has become predominantly dark purplish in colour; fine to medium grained, in places coarse grained very impure sandstone; contains minor reddish hematitic and light pinkish quartzitic bands, and some narrow, fine, buff coloured mud seams along partings. Contains also buff coloured clay filled blebs 1/16" to 1/4" across (clay alteration?). Crossbedding is not apparent. All minerals, except quartz, altered to clay or fine purplish material.					
341'	345'	Light to dark purplish-gray coloured, with gradual indistinct banding. Poorly sorted, fine to coarse grained impure sandstone with clay in matrix. Some intergranular porosity. Hard. Bedding is indistinct.					
345'	357'	Sandstone, as in 336'-341' above. Strongly and repeatedly banded.					
357'	383'	Sandstone, as in 341'-345'. The very fine to medium grained quartz-rich light pink to light purple coloured impure sandstone in top part of this section becomes very gradually coarser and porous toward the bottom. A					

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	CORE SAMPLES FROM	TO	WIDTH	%	AVERAGES
		broken portion of core from 372' to 374' is soft and friable, with clay matrix and pyrite blebs along fractures. Gradually grades into next section below:					
		(383' to 419': RED MUDSTONE = TRANSPORTED REGOLITH)					
383'	419±	The core has changed from quartz sandstone above into predominantly purplish brown to dark brick red mud- or siltstone, containing sand grains and some angular to subangular quartz clasts (up to ¼") and thin buff to grey coloured mud or clay seams (1/16" to 1/4" thick, horizontal ±), in repeated successions. Some bedding. Section from 390' to 408' contains only a few quartz clast (mostly 1/16" to 1/4" across) in fine, dark reddish-brown clay-like matrix with poor porosity. From 408' downward, large angular clasts of quartz, up to 1" across, start to appear, usually in poorly defined layers. Grades into next section below: (±419' to 433': PRE-ATHABASCA REGOLITH) Core recovery about 97%					
419'	429'	The above red mudstone has now gradually changed into brecciated regolith: The quartz clasts have increased in size (up to several inches across) and frequency (up to 50% of content); enclosed in the above red, fine grained mudstone as matrix. Some clasts of altered (chloritized, hematized) basement fragments appear. Colour dark reddish brown to brownish black. (Part of section from 424' to 426' is very much like section 383'-419'.) Very hard; poor porosity; good recovery (including all previous sections) Silicification increases toward bottom of section.					
429'	433'	The above regolith becomes even coarser and more brecciated and silicified. The original igneous - metamorphic textures are not yet apparent. Part of this section, 429' to 430', is mainly light-greenish quartz, with chlorite scattered throughout. The red hematitic material grades locally into thin veinlets of specular hematite. All rock forming minerals, except quartz, are altered. Very hard, no porosity. Quartz clasts form more than 50% of core.					
		(433' to 475': ALTERED-WEATHERED PRECAMBRIAN BASEMENT)					
433'	444±	Sharp change from above brecciated rock into a medium grained, strongly altered and weathered, dark reddish-brown rock: Relict foliation (±45° to core axis) probably indicates the original gneissic texture of rock. At					

DIAMOND DRILL HOLE LOG

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	CORE SAMPLES FROM	CORE SAMPLES TO	CORE SAMPLES WIDTH	CORE SAMPLES %	CORE SAMPLES AVERAGES
		(433' to 444'±, con't) about from 437' downward, the core becomes more strongly silicified and the gneissic texture is harder to discern.					
444'±	456'±	The core consists now largely of quartz and altered greenish feldspars, with irregular blebs and small stringers of dark red-brown hematite. Very strongly silicified, no porosity; hard, The above gneissic texture becomes completely obliterated. Quartz is mostly pale green, with some whitish clasts.					
456'±	467'±	The above grades back into altered, weathered, gneissic rock, similar to 433'-444' above. Contains also 2-3 highly silicified portions similar to 444'-456' above. Very gradually changes to less weathered and altered granitic gneiss (gneissosity about 60^{o}-70^{o} to core axis).					
467'±	470'±	The core has now become still altered but recognizable dark reddish to dark gray granitic gneiss. Clay minerals in fractures.					
470'	475'	Granite. Reddish; medium to coarse grained, still slightly altered; top part pegmatitic.					
		(475' to 478': UNALTERED GNEISS)					
475'	478'	Reddish dark grey gneiss, quite fresh and unaltered. Last 6" mostly whitish quartz.					
		(END OF DDH #14 @ 478'.)					
		The core was checked with SPP2 scint.: no N/A above 2 x B.G. was encountered The DDH #14 was also logged with a downhole gamma-ray probe for the Total Count (plotted separately). The centre part of the red mudstone section, about 398' to 408', has readings 4-6 x B.G.					
		Drilled by: D.W. Coates Enterprises Limited Driller: Larry Ross					

PROJECT 508

TOTAL COUNT - Integral mode.

RADIOMETRIC LOG - D.D. HOLE 508-14

FEB. 19, 1977

CORE SIZE : BQ

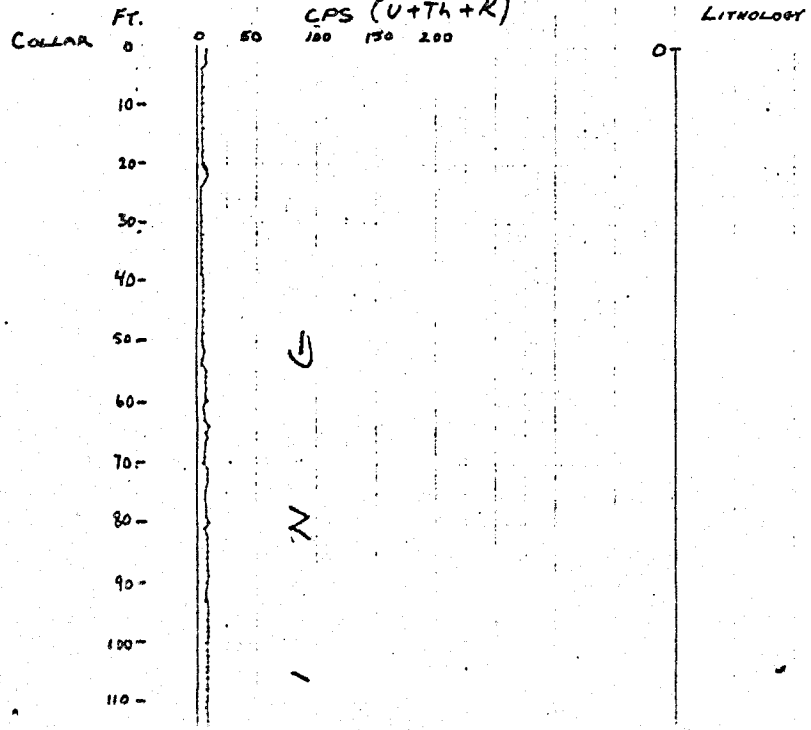
INSTRUMENT : SCINTREX GSD-3; GAM-1

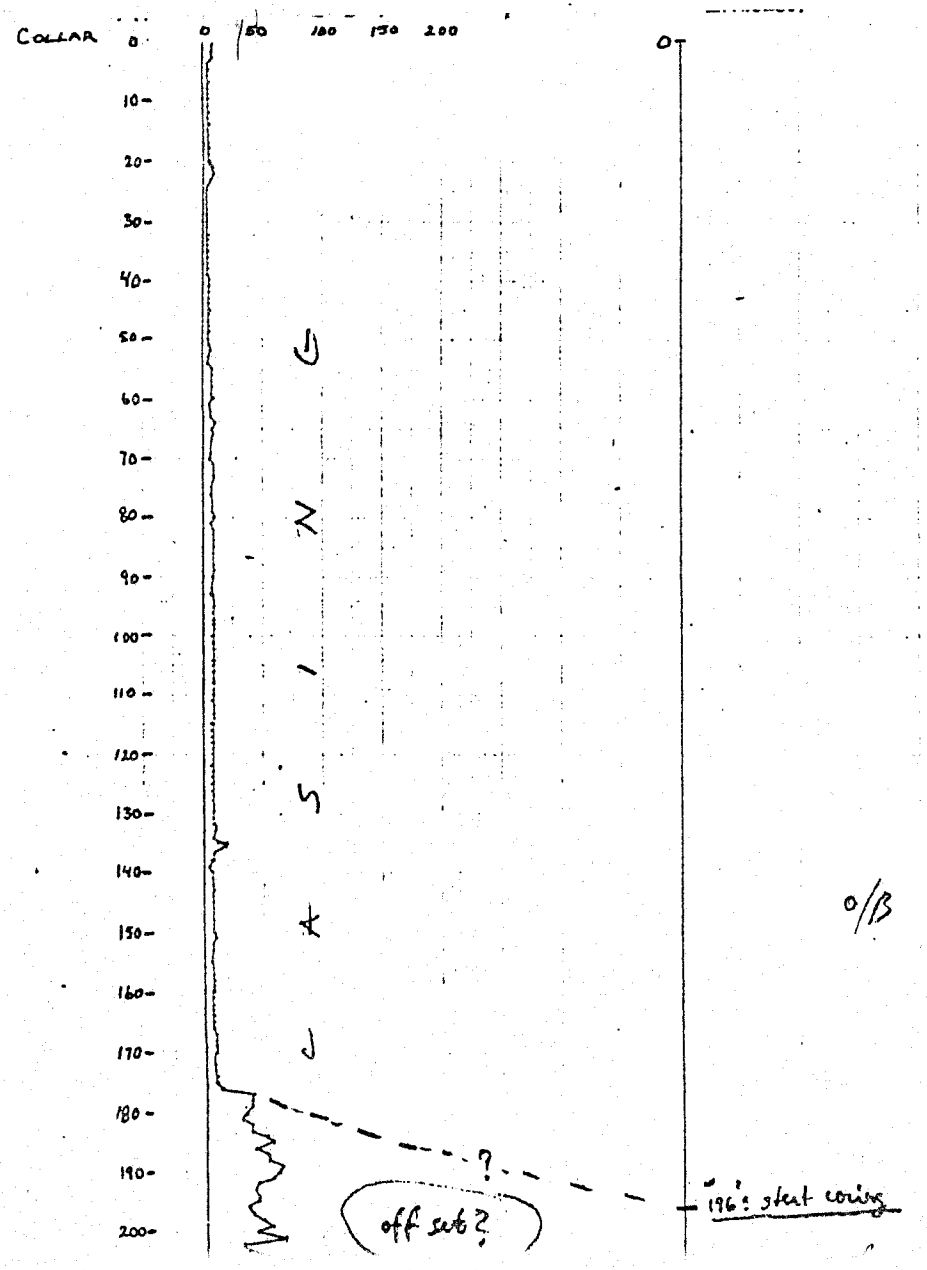
OPERATORS : H.L., H.D., N.M.

(logged manually, no recorder)

DDH#508-14

(1)

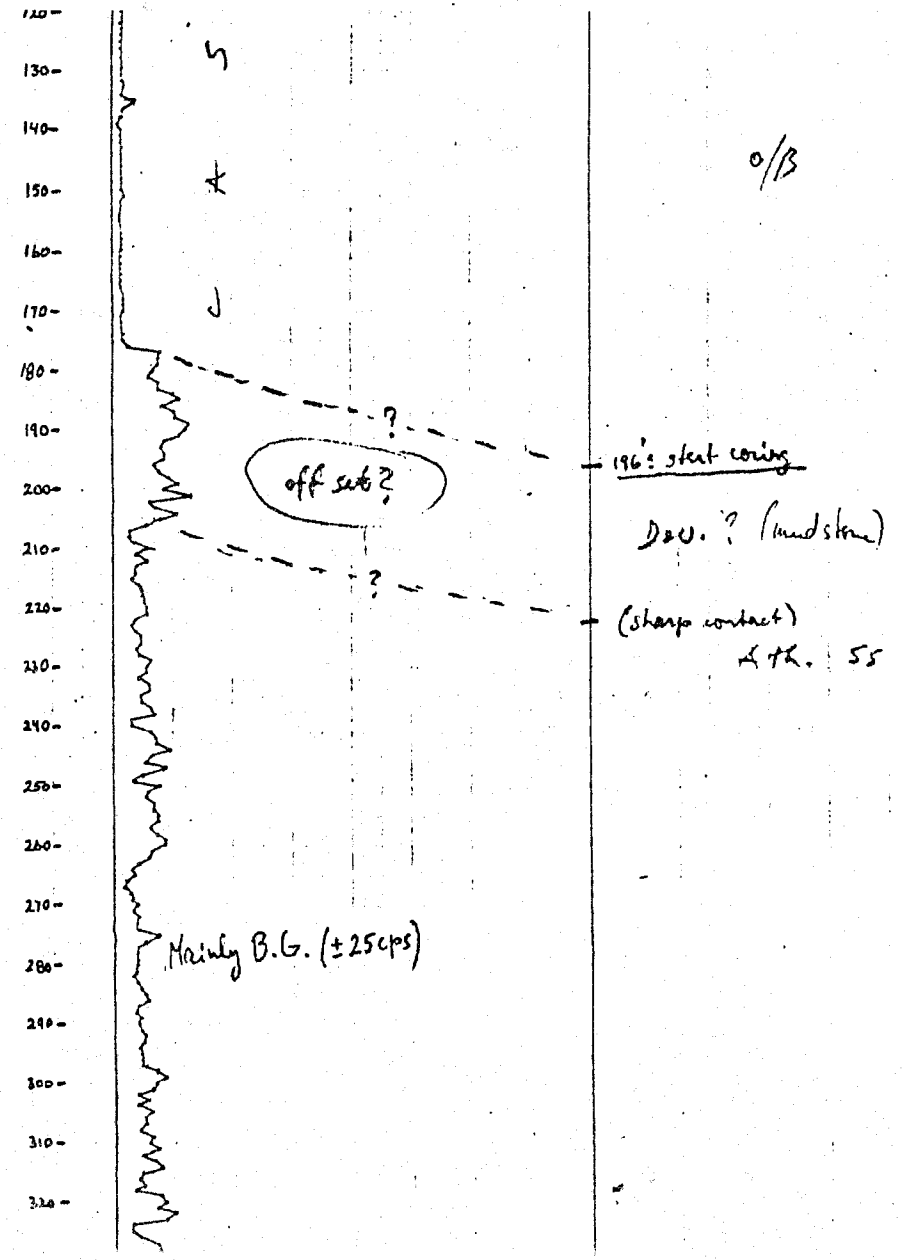




DDH#508-14

(2)

0/13



0/B

196': start coring

D&U. ? (mudstone)

(sharp contact)

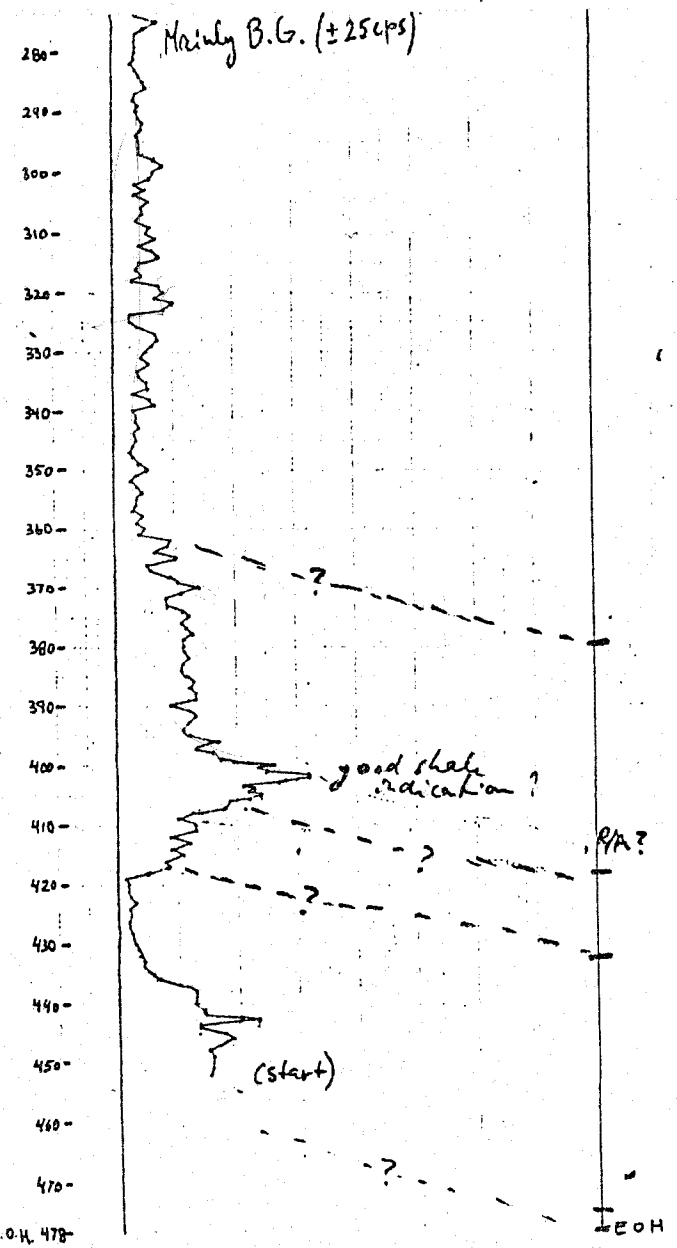
Δ Th. 55

DDH#508-14

(3)

DDH#508-14

(4)



Impure Ath ss

↓

becomes
v.f. muddy ss/sh (Transported ryolith?)

↓

becomes brecciated

Brecciated ryolith in v.f. muddy sh matrix

↓

sheared + weathered
gneiss

↓

weathered pE basement

DIP TESTS

TEST	FROM	TO	TOTAL	DIP CORR.	LATITUDE CUM.	DEPARTURE CUM.

DIAMOND DRILL HOLE LOG

Project 508

ELDORADO NUCLEAR LIMITED

LOCATION Permit 217
SECTION
LATITUDE
DEPARTURE
ELEVATION Surface
CORE B.Q.
STORAGE Base Camp, 508

HOLE No. DDH # 508-15
AZIMUTH
DIP Vertical
LENGTH 238'
PURPOSE Recco (strat.)
COMPLETED Feb. 20, 1977
LOGGED BY H. Laanela

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION
0'	170'	Overburden
		(170' to E.O.H. @ 238': PRECAMBRIAN BASEMENT)
170'	191'	Dark gray medium grained hornblende gneiss. Strongly foliated @ 60°-70° to core axis, some fracturing along foliation. Top 1½' crumbly and broken with some feldspar altered to clay (recent weathering). Feldspar becomes progressively fresher and more reddish-pink toward bottom. Dark (mafic) minerals estimated about 65-70%, feldspar about 30%, very little quartz.
191'	200'	The above gneiss becomes progressively less and less foliated, with some parts, ½" to several inches thick, becoming granitic. Reddish feldspars become more common, rock becomes generally coarser grained. Quartz in granitic portions. Minor weathering along fractures.
		Core from about 193' to about 198' is very dark, almost black, with red feldspars, and gneissic texture no longer discernible. It has a porphyritic appearance. Quartz-filled veinlets and fractures from 198' to 200'. At 200' the rock is fractured and apparently intruded by coarse reddish granite.
200'	202'	Coarse red granite.
202'	238'±	The above are repeated as follows: Gneiss from 202' to 204'; granite 204'-206'; porphyritic and less foliated gneiss 206'-213'(±); granite 213'-215'; porphyritic gneiss 215'-238' (with some granite @ 217'-218', 225'-227' and 236'-238') All changes become more and more gradational.
		(END OF DDH #5 @ 238 feet)
		Core was tested with a SPP2 Scint.; no anomalous radioactivity (eg. more than 1½-2 x B.G.) was detected.
		About 70' of casing was lost in the hole (broken).
		Drilled By: D.W. Coates Enterprises Limited Driller: Larry Ross
		COMMENTS: Core consists mainly of dark hornblende gneiss, locally with strong foliation; no appreciable weathering. Intruded and altered by granite.

CORE SAMPLES FROM	TO	WIDTH	%	AVERAGES

DIP TESTS

TEST	FROM	TO	TOTAL	DIP	DIP CORR.	LATITUDE	LATITUDE CUM.	DEPARTURE	DEPARTURE CUM.

DIAMOND DRILL HOLE LOG

Project 508

ELDORADO NUCLEAR LIMITED

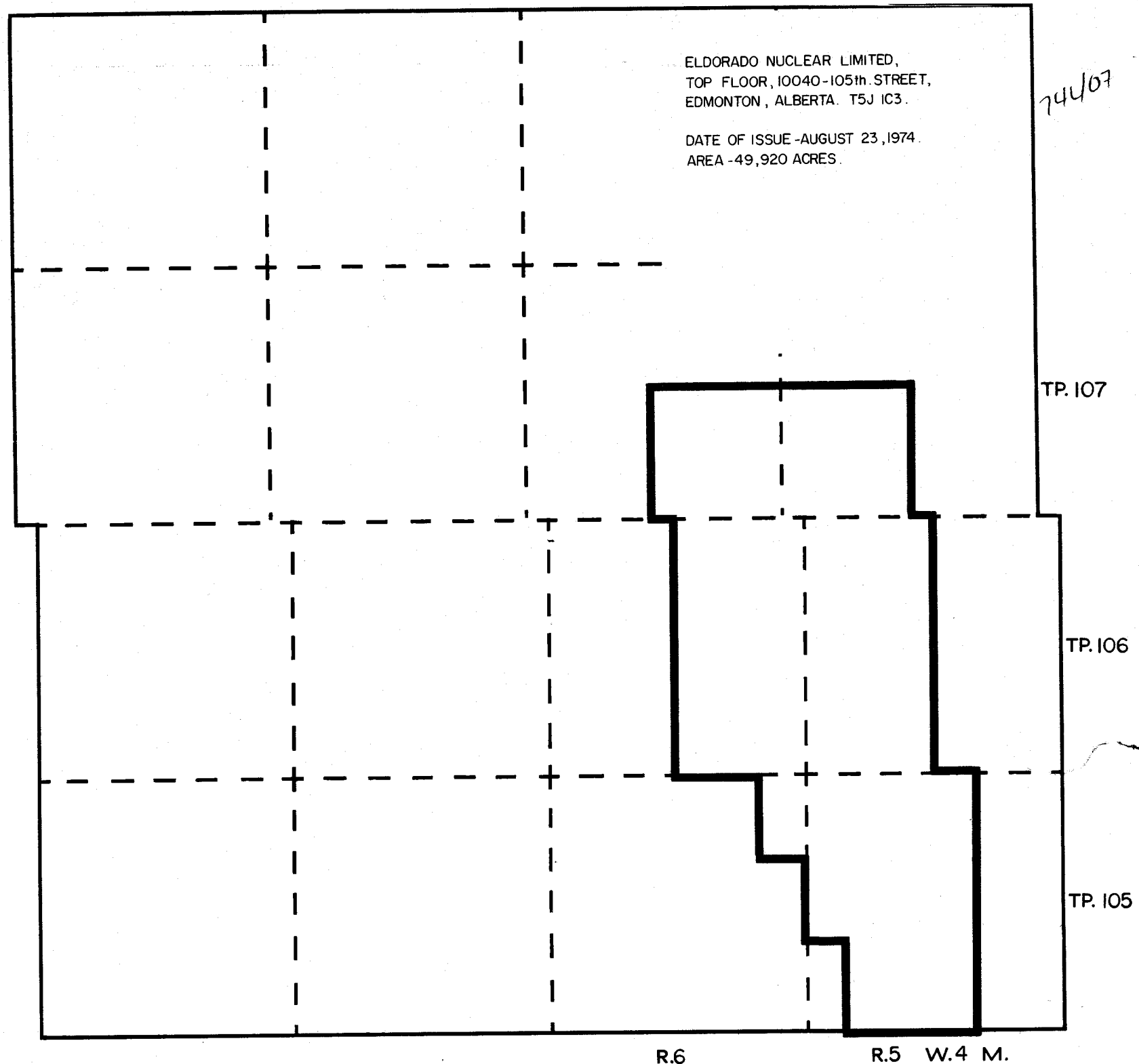
LOCATION North of Permit 215
SECTION
LATITUDE
DEPARTURE
ELEVATION Surface
CORE B.Q.
STORAGE Base Camp (508)

HOLE No. DDH #508-16
AZIMUTH
DIP Vertical
LENGTH 568'
PURPOSE Recco (strat.)
COMPLETED Feb. 24, 1977
LOGGED BY H. Laanela

FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	CORE SAMPLES FROM	TO	WIDTH	%	AVERAGES
0'	110'	Overburden; many boulders in the last 20'±.					
		(110' to 568': ATHABASCA FORMATION)					
110'	209'	Athabasca Sandstone: Light pink to buff coloured throughout, with very little change in colour, texture or grain size. Fine to locally medium grained, minor crossbedding in places (80°-70° to core axis), occasional mud chips. Good core recovery, about 90-95%. Some intergranular and minor fracture porosity, a few small vugs locally. Hard.					
		Minor (less than 5%) "dead oil staining" throughout this section, mostly in layers and "fingers" from ⅛ to 1 inch thick and parallel to bedding, associated with greater porosity. Oil stain locally increases to 10-15% on some ½-2 feet intervals. Frequency of oily streaks increases toward the bottom of this section. Minor purplish mottling and layering appears from about 142' down.					
63.7	84.4	Vertical fractures from 163'-165' (with minor clay and oil stain) and 183.5'-184.5' (with brownish clay, and oil stain).					
209'	277'	Sandstone as above, but with increased frequency and thickness of oily streaks. "Dead oil stained" sandstone about 10-20% of total core, locally more than 40-50% in sections ½ to 1½ feet thick; a few streaks are several inches wide. Grades into less oil stained sandstone below. Oily streaks parallel bedding (90°-70° to core axis). A few isolated mud chips.					
277'	365'	Athabasca sandstone as in previous sections. Oil staining (less than 5%) disappears completely below 290', sandstone becomes even more homogenous and uniform: pale pinkish buff in colour, fine to medium grained, almost no fracturing, very few mud chips and minor vugs, intergranular porosity. Sorting poor; minor crossbedding. Core broken from 298' to 312' (with some vertical fracturing in last 2 feet.) Vertical fractures from 301'-313' are partly filled with small pyrite crystals; pyrite also permiates the core up to ½" to 1" from the fracture. Grades very gradually into section below.					
365'	400'±	Sandstone has more noticeable dark pink to light purplish streaks along bedding planes. Crossbedding has become more noticeable (about 20-50° locally to core axis), also minor sorting. Otherwise not much change. Oil staining has completely disappeared, core is hard, unbroken, not fractured, with intergranular					

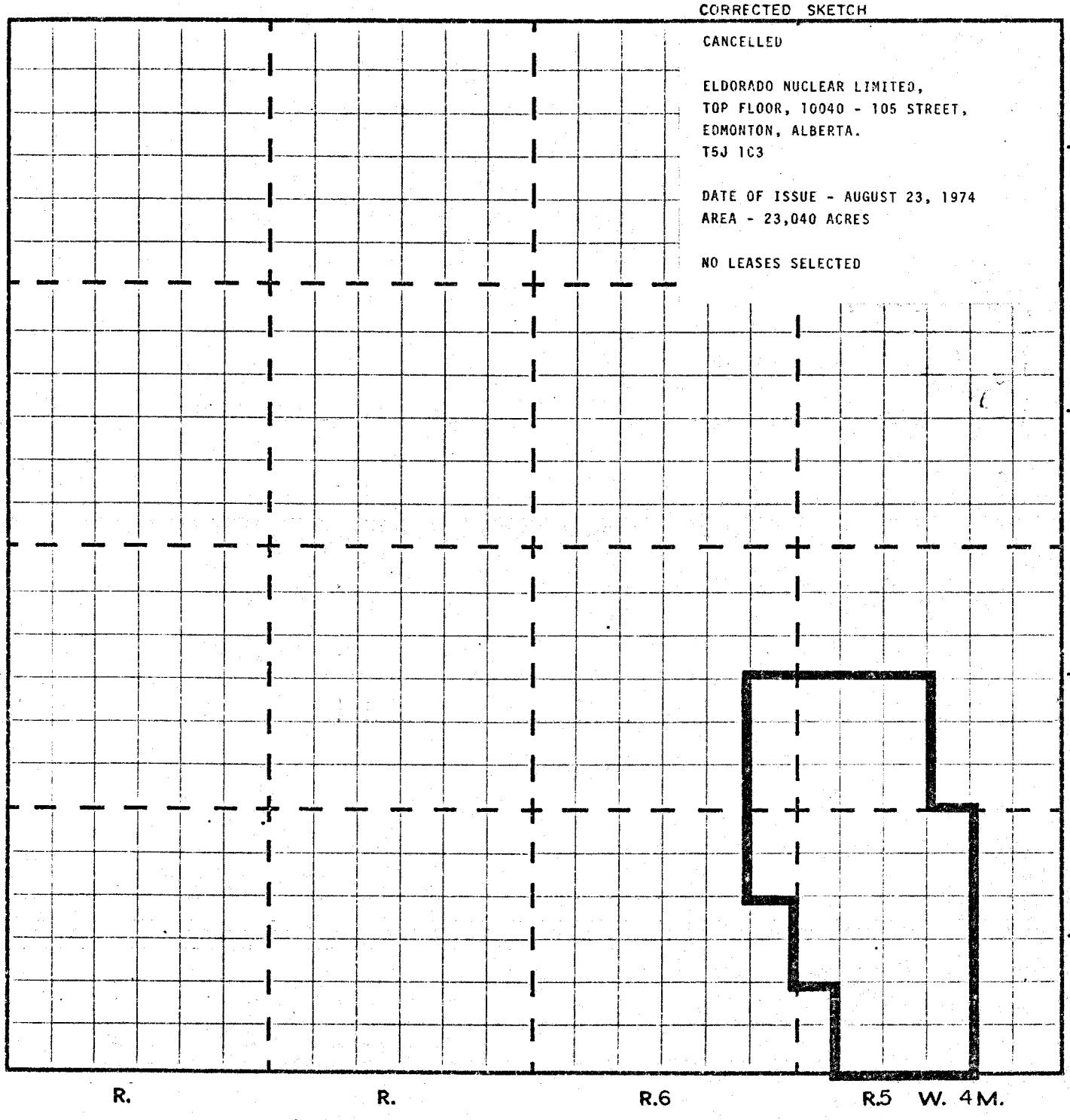
FOOTAGE FROM	FOOTAGE TO	DESCRIPTION	CORE SAMPLES FROM	CORE SAMPLES TO	CORE SAMPLES WIDTH	CORE SAMPLES %	CORE SAMPLES AVERAGES
		(365' to 400'±, con't) porosity. Colour predominantly light pinkish buff. Occasional mottling caused by small blebs of pyrite (also pyrite in some minor fractures). Grades gradually into section below.					
400'	568'	Sandstone has become more homogeneous and uniform again, (similar to section 277'-365'). Pyrite more common, occurs as streaks (parallel to bedding), in some minor fractures, and as irregular blebs, usually less than 1%, in the top half of the section. Some reddish, hematitic and porous parts in the lower 50', in the coarser grained and more porous parts. This part has also some more noticeable sorting and crossbedding.					
		(END OF DDH #16 @ 568 feet)					
		Core recovery has been from 95% to almost 100% throughout all sections. Generally, very little change; any minor changes seen occur gradually over tens of feet. Radioactivity of core (scanned with SPP2 Scint.) only 20-40 cps (±B.G.)					
		Drilled By: D.W. Coates Enterprises Limited Driller: Larry Ross					

QUARTZ MINERAL EXPLORATION PERMIT NO. 187 A-AL-117

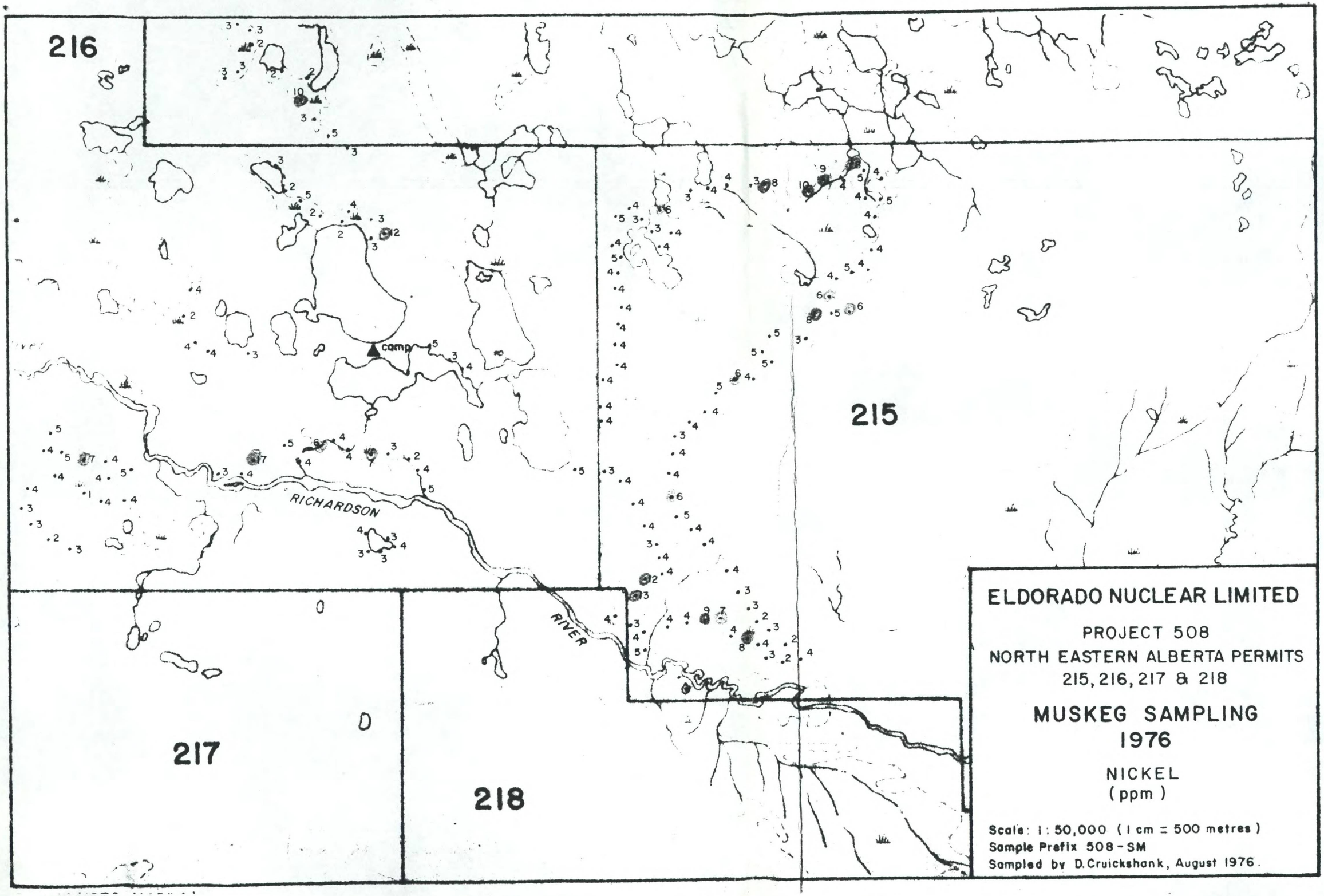


19770004

QUARTZ MINERAL EXPLORATION PERMIT NO. 187a



see file permit 185 U-AF-115 for report.



ELDORADO NUCLEAR LIMITED

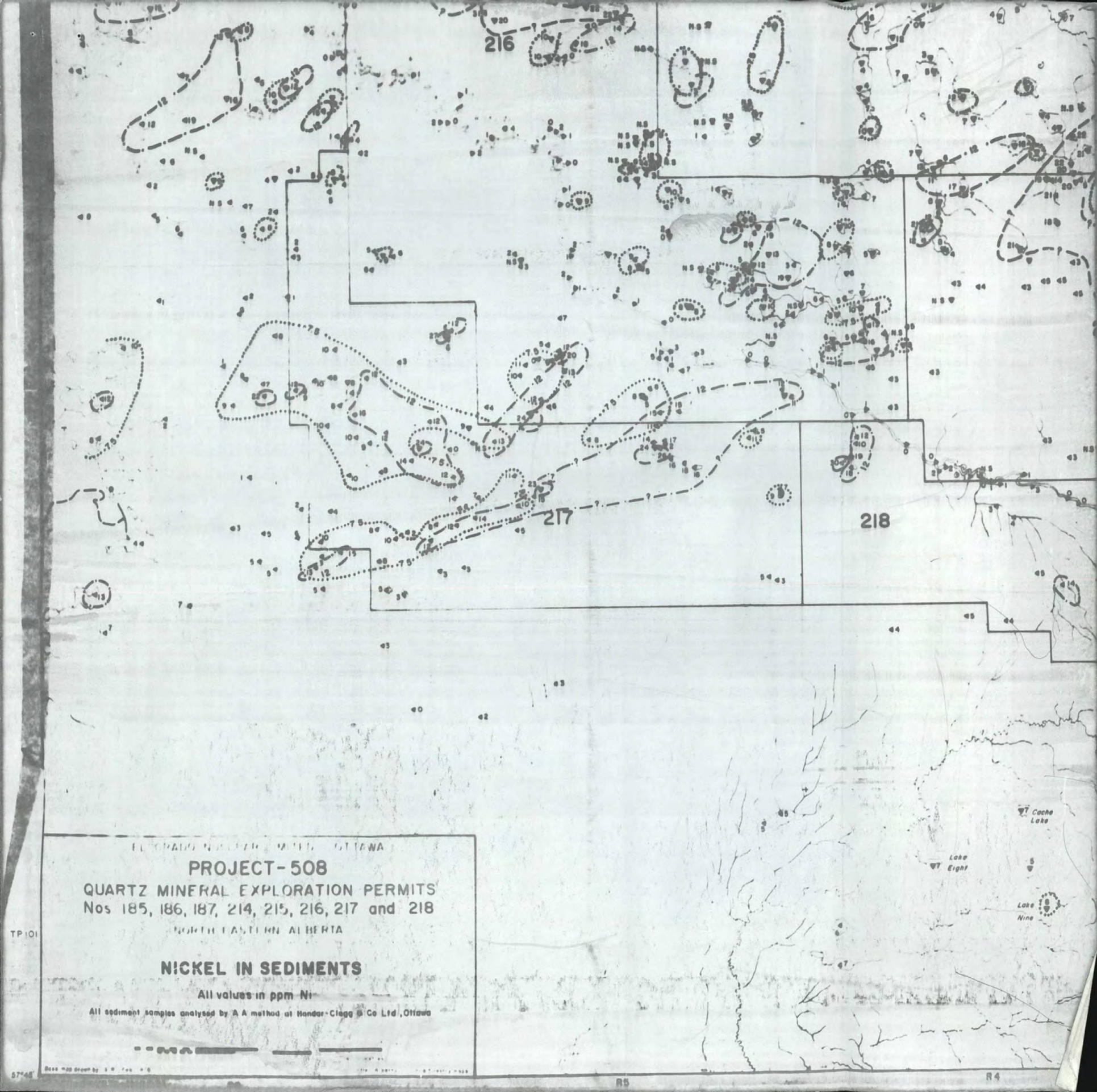
PROJECT 508

NORTH EASTERN ALBERTA PERMITS
215, 216, 217 & 218

MUSKEG SAMPLING
1976

NICKEL
(ppm)

Scale: 1 : 50,000 (1 cm = 500 metres)
Sample Prefix 508 - SM
Sampled by D. Cruickshank, August 1976.



PROJECT-508

QUARTZ MINERAL EXPLORATION PERMITS
Nos 185, 186, 187, 214, 215, 216, 217 and 218

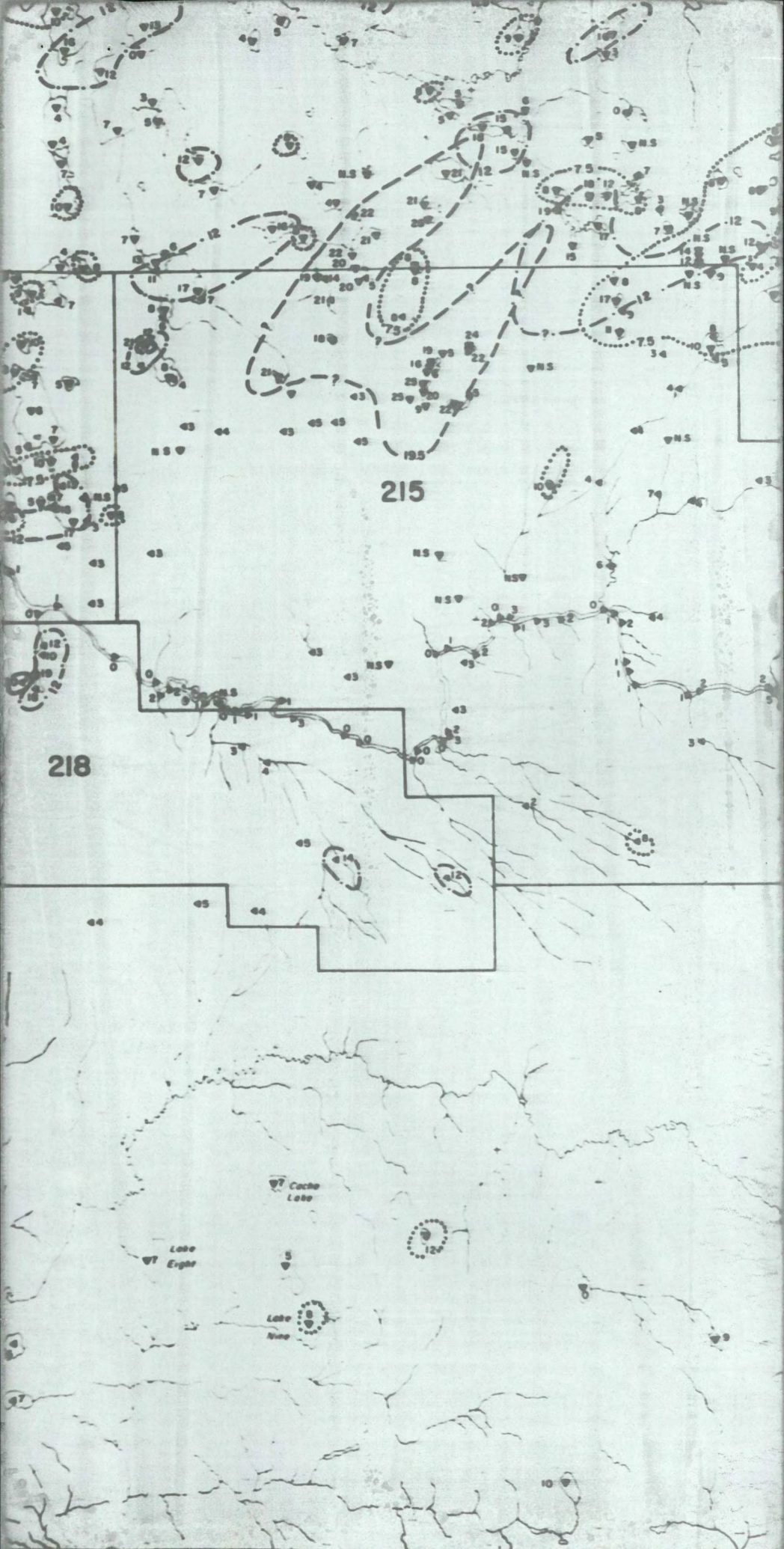
NORTH EASTERN ALBERTA

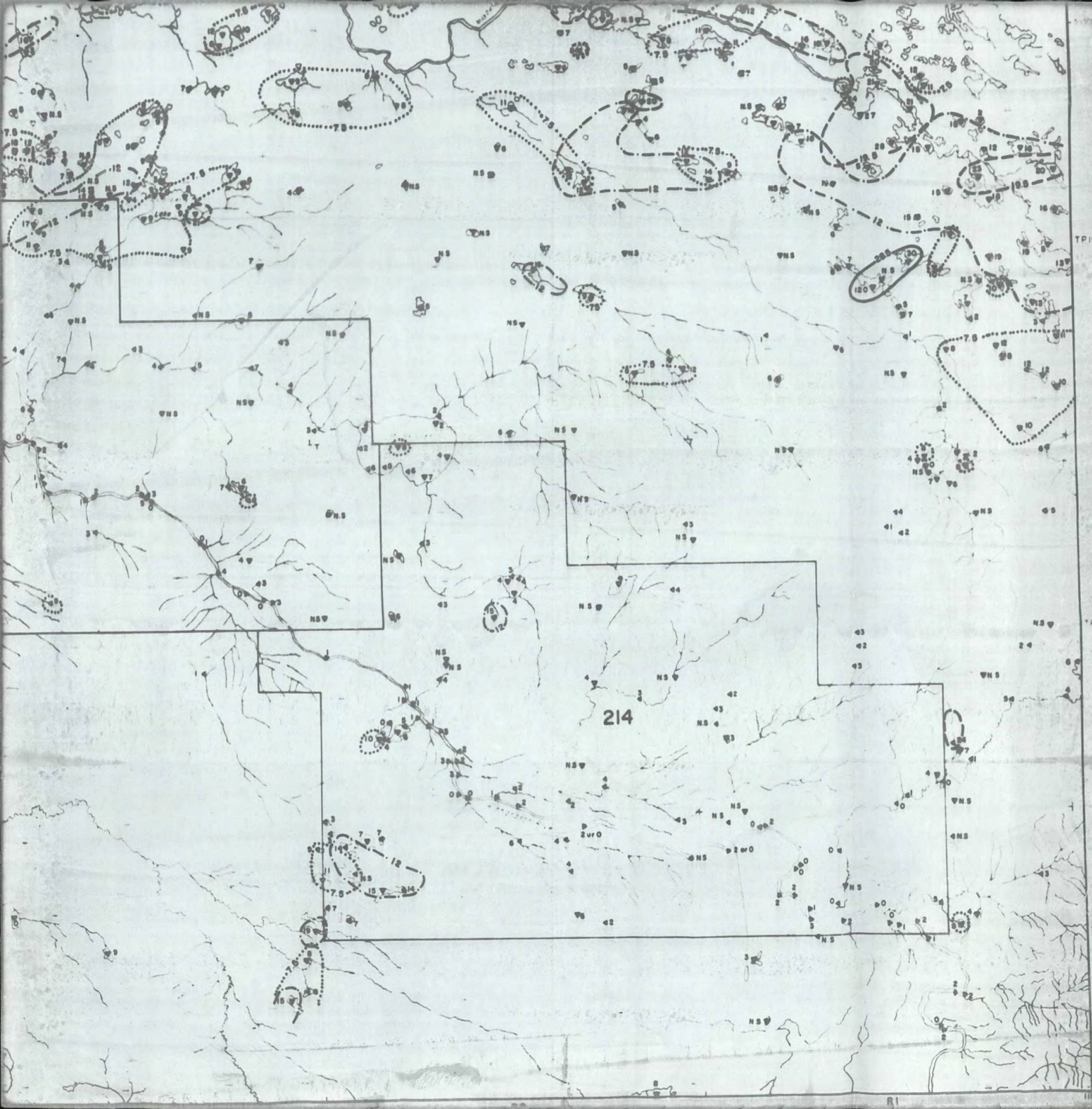
NICKEL IN SEDIMENTS

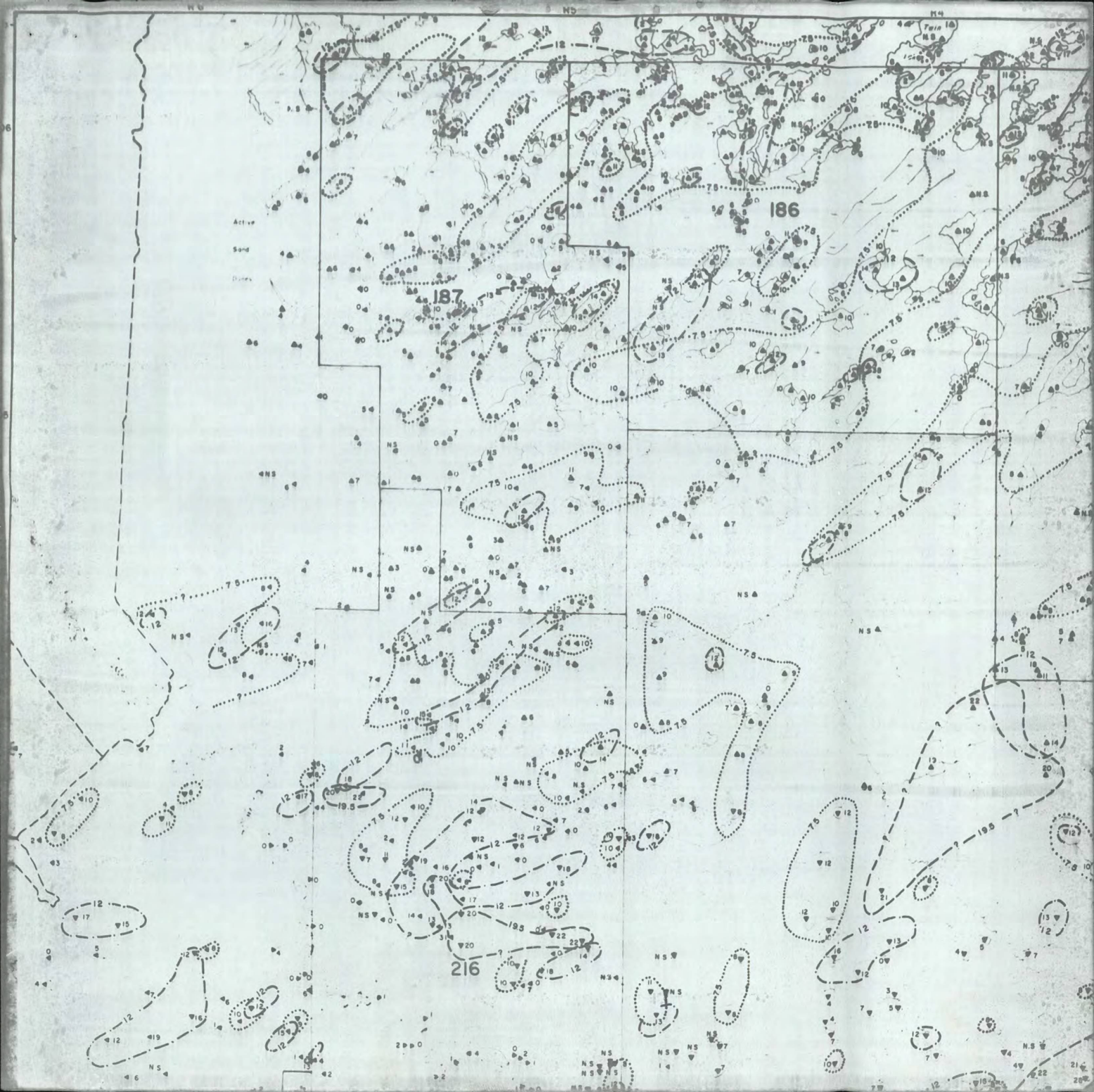
All values in ppm Ni

All sediment samples analysed by A A method at Hunter-Clegg & Co Ltd., Ottawa

TP101


215
218
Cacha Lake
Lake Ergas
Lake Nino
R4
R3


214
TP103
R1


186
187
216
Active
Sand
Dunes

Contamination ?

185

REFERENCE

LIMITS OF GEOCHEMICAL POPULATIONS:

(ppm. Ni) (Estimated from graph)

Predominantly E (definitely anomalous)
(contains: 94 % of E and 6 % of D.)

28.5 ——— D and E o… about 6 %

Mainly D (anomalous)
(contains: 6 % of E, 83 % of D, and 14 % of C.)

19.5 — — — — — — — — C and D o… 14 and 11%

Mainly C (probably anomalous)
(contains: 11 % of D, 77 % of C, and 9 % of B.)

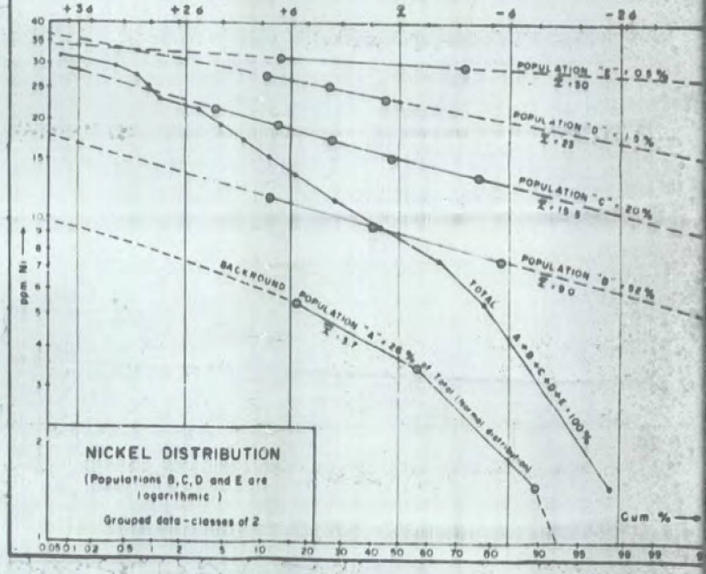
12 — · — · — · — · — B and C e… 9 % each

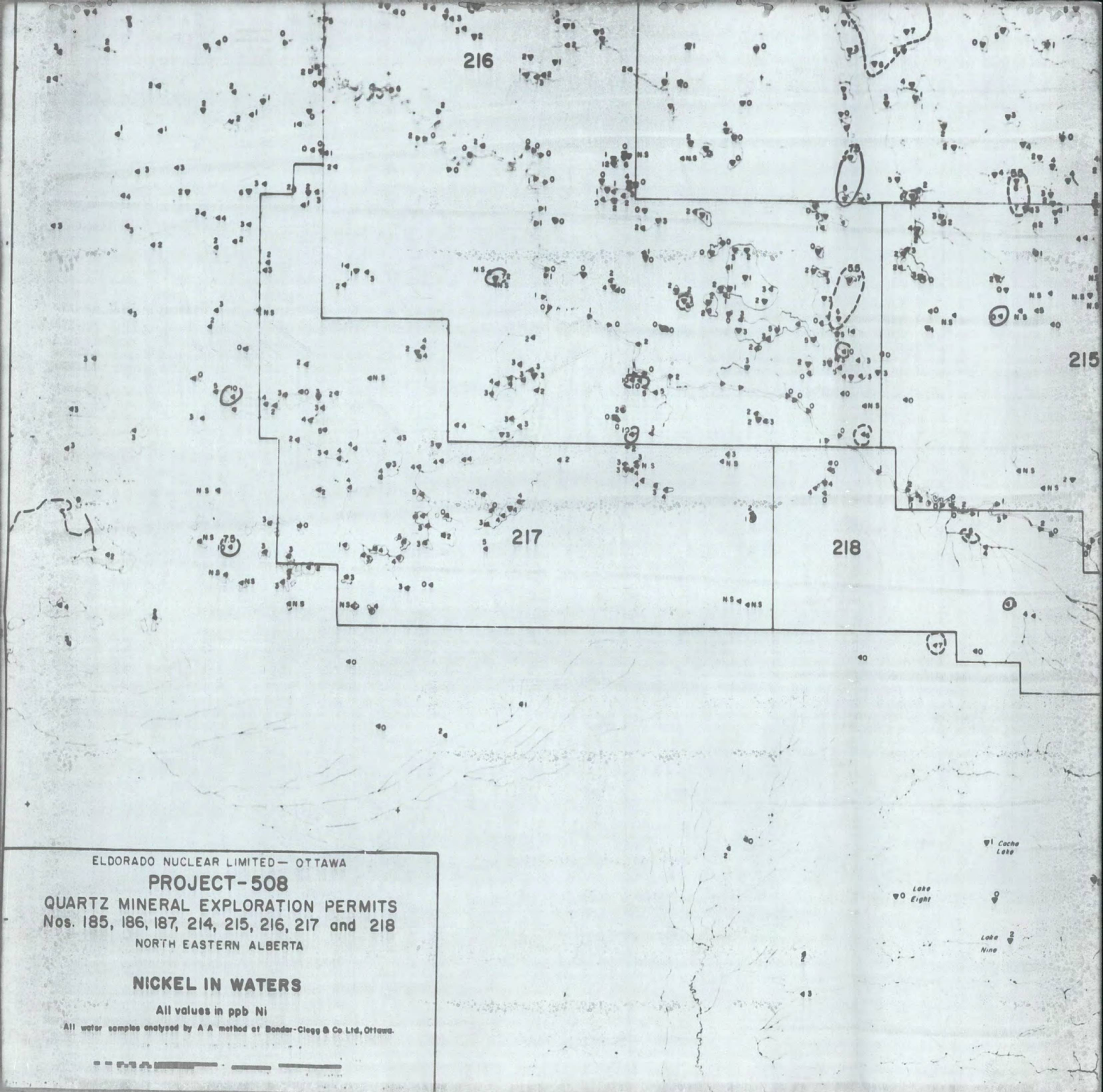
Mainly B (possibly anomalous)
(contains: 9 % of C, 74.3 % of B, and 2.3 % of A.)

7.5 ····· (Threshold of A population) ····· Overlap at $\bar{X} + 2.6$ of… and $\bar{X} - 2.6$…

Almost all of A (regional background)
(contains: 16.7 % of B, and 97.7 % of A.)

N.B Contours are calculated to give about equal % of overlap between adjoining populations





ELDORADO NUCLEAR LIMITED— OTTAWA

PROJECT-508

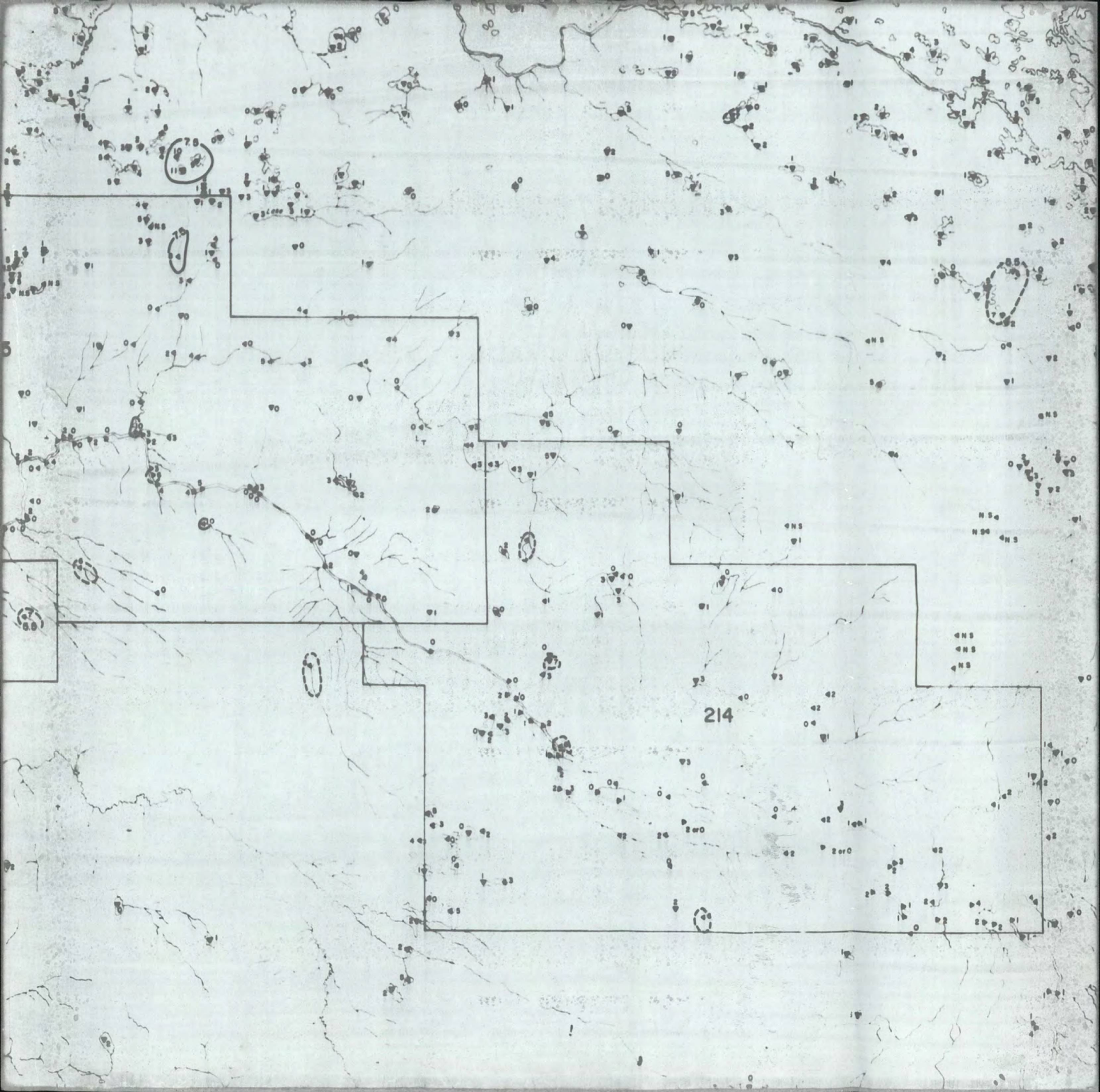
QUARTZ MINERAL EXPLORATION PERMITS Nos. 185, 186, 187, 214, 215, 216, 217 and 218

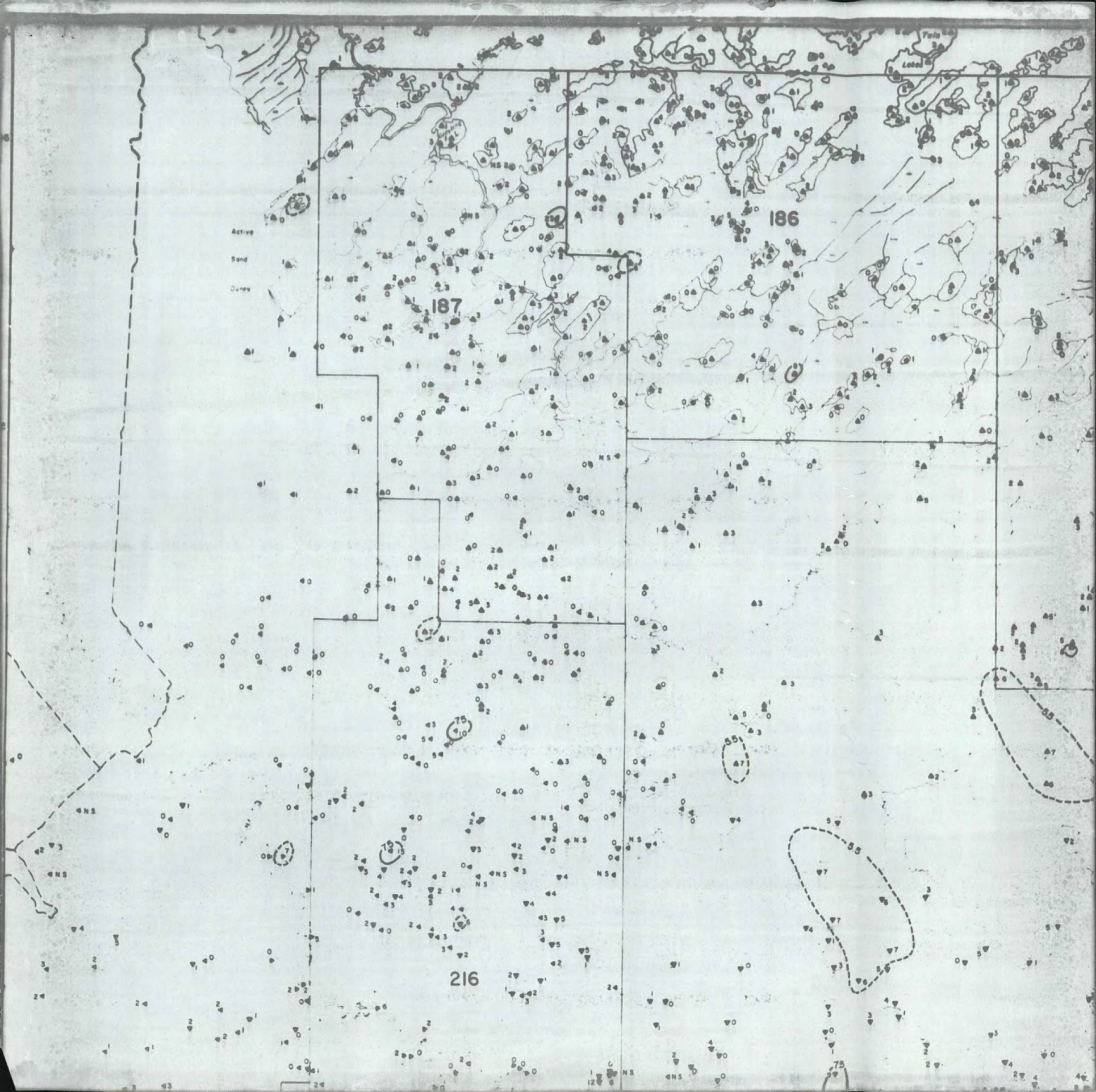
NORTH EASTERN ALBERTA

NICKEL IN WATERS

All values in ppb Ni

All water samples analysed by A A method at Bondar-Clegg & Co Ltd, Ottawa.


214


186
187
216
Active
Sand
Dunes
NS
55
75

185

7.5

REFERENCE

LIMITS OF GEOCHEMICAL POPULATIONS
(Estimated from graph.)

(ppb Ni)

Mostly C (probably anomalous)

(contains: about 13% of B, and about 87% of C.)

7.5 ——————————

B and C overl
about 13% ea

Mostly B (possibly anomalous)

(contains: 2.3% of A, about 87% of B, and about 13% of C.)

5.5 — — — — — — — —

($\bar{x}$+2 σ of A)
A and B overl
2.3 and 0.15%
respectively

Predominantly A (background)

(contains: 97% of A and 0.15% of B.)